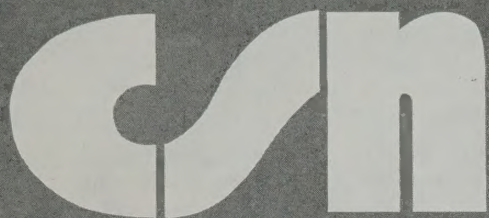


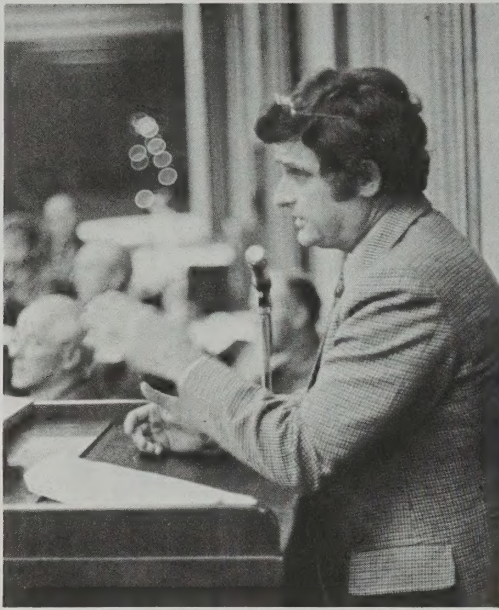
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CALIFORNIA SAFETY NEWS

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CHIEF CHAMBERS ...ON SAFETY



David L. Chambers, Chief of DIS

There seems to have been some confusion over the definition of a serious violation versus a nonserious violation among our compliance safety engineers. This difficulty has been resolved and as a result, in the future serious violations will be recognized as such by field personnel.

The Labor Code states that a "serious violation shall be deemed to exist in a place of employment if there is a substantial probability that death or serious physical harm could result from a condition which exists, or from one or more practices, means, methods, operations, or processes which have been adopted or are in use in such place of employment unless the employer did not, and could not with the exercise of reasonable diligence, know of the presence of the violation (§6432)."

As an indication of serious physical harm, serious injury or illness is defined by the Labor Code as "any injury or illness occurring in a place of employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or in which an employee suffers loss of any member of the body or any serious degree of permanent disfigurement (§6409(c))."

An unguarded V-belt could be an example of a possible serious violation. The probability that a serious injury will occur—an amputation in this case—mandates that the classification serious be considered.

Poor housekeeping is another violation which frequently could be considered serious. For instance, if a work area is littered with boxes, sawdust, or other combustible materials and organic solvents are being used in the area, the probability that a fire will occur which would cause serious injury to employees is sufficient to warrant that a violation with the classification of serious be considered. Poor housekeeping which involves an area littered with solvent permeated rags represents another instance of a serious violation. A work area strewn with electrical cords which might be cut or create a fire danger in conjunction with debris in the vicinity exemplifies another situation which could be considered serious.

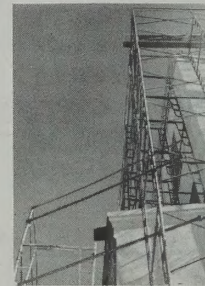
Serious violations must be reinspected by the compliance safety engineer to ensure that they have been corrected. Serious violations also take more time to process than nonserious violations and result in an automatic fine of up to \$1,000 to the employer. If a serious violation is willful and/or repeated it may be assessed a penalty of

up to \$10,000. However, the time element and cost *must not* be considered factors in determining whether a violation is serious or nonserious.

The basic elements to classify a violation serious, in contrast to nonserious, are:

1. Substantial probability that death or serious injury could result from an existing condition, and,
2. Employer had, or with exercise of reasonable diligence, could have had *knowledge* of the presence of the violation.

Compliance safety engineers are obligated to abide by the law in determining the gravity of a violation. They are expected to apply the law to large and small employers equally and are not to permit personal bias to become a variable in their decisions.



COVER SHOT

The scaffolding pictured on the cover was in the process of being erected. Planks, guardrails, and toeboards will be added to complete it. The topic of our feature article this month, see the article about scaffolding by Robert Sarni on pages four and five.

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ROAD OILER FATALITY

Gene Peabody, Senior Engineer, Division of Industrial Safety

The explosion of a bitumen tank (known in the construction trade as a road oiler) has caused the decapitation of a 49 year old California workman.

After a road is graded and leveled, hot oil



A workman, killed by the explosion of road oiler with which he was working, is an ugly reminder of the danger of inadequate, over-pressurized tanks.

is sprayed on the road to act as a binder for the sand and gravel surface. In this case, the vessel used to contain the bitumen oil was pressurized by an air compressor at the same time it was being heated by a propane burner through a four inch end-to-end flue.

The vessel itself was a galvanized water surge tank not designed to be used under high pressure. It was purchased by the employer and modified in his shop for use as an oiler. The vessel had one convex and one concave head and the shell was lapped with a single fillet weld. Furthermore, the unit did not have a safety relief valve or pressure indicating gage.

The combination of these things led to the vessel becoming overpressurized. The result was an explosion which blew the convex fifty pound head of the vessel 130 feet, fatally injuring the workman who was doing the spraying. The head continued on its course, smashing through the wall of a house and landing on a coffee table within. Fortunately, no one inside the house was injured.

The employer has been cited for three serious violations of the California Unfired Pressure Vessel Safety Orders. They are:

- 1) 8 CAC 459(c), using a vessel for other than its intended use.
- 2) 8 CAC 467, failure to protect a pres-

sure vessel with one or more safety valves.

- 3) 8 CAC 560(c), using compressed gas to transfer a substance from a container that was not designed to withstand the maximum possible pressure applied with a safety factor of 4.

The case has been turned over to the Bureau of Investigation for possible criminal prosecution. If found criminally negligent, the employer faces a \$10,000 fine and/or 6 months in jail.

Employers using this type of equipment are urged to contact their insurance company or the Pressure Vessels Unit of the Division of Industrial Safety, to determine if their equipment is in compliance with the Safety Orders of the Division of Industrial Safety.

Pressurized hot oil road oilers or any other such type equipment shall be:

1. Manufactured, inspected and stamped in compliance with Section

VIII, Division 1 of the ASME Code.

2. Fitted with an ASME safety valve in direct communication with the tank and set to open at the maximum allowable working pressure of the tank, or less and having a capacity at least equal to the compressor capacity. This safety valve shall be fitted with a device for manually raising the disc from its seat. It is preferred that this safety valve be installed in the air supply piping between the compressor check valve and the tank connections provided that there is not a stop valve at the tank top.

3. Fitted with a pressure gage having a dial graduated to indicate pressure at least 1.2 times but not more than approximately double the pressure at which the safety valve is set to open.

4. In compliance with paragraph UG 35(b) of Section III, Division 1 of the ASME Code if the tank filling opening is of the quick opening type.



A view of the blown-out end of the tank where it finally came to rest in a house near the work site.

STEPS TO SCAFF

By Robert Sarn

To many people, the word scaffold is still thought of as the thirteen step structure for which one way tickets only are sold. Let me assure you that many of the makeshift, last minute scaffolds erected on our construction jobs today without thought or design are every bit as deadly as those scaffolds which led to the hangman's noose! According to figures recently released by the Scaffolding Insuring Institute of America, falls constitute almost 25% of all construction accidents and the majority of these falls are from 20 feet high or less. Needless to say, these falls can lead the worker to his final eternity and his employer to financial oblivion.

There are three basic types of scaffolds:

1. The built up scaffolds which are built in place.
2. The rolling towers which are always represented on all construction jobs.
3. The suspended scaffolds.

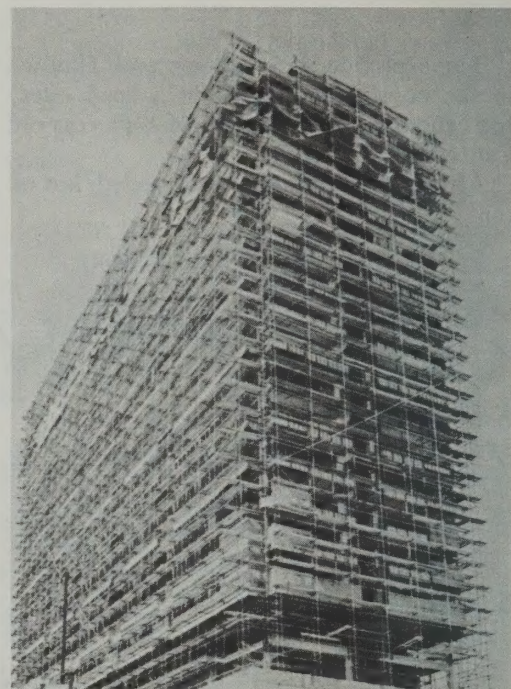
Scaffolding, even when properly erected and accurately designed, poses an extra hazard for workmen simply because of the nature of its use. Extra precautions must always be observed whether you are working on a scaffold ten feet high or on one 200 feet high.

Solid planking of good quality with toe boards and guard rails shall be on all required working levels. A metal scaffold shall be tied to the building at least every twenty feet horizontally and thirty feet vertically with double wrapped number twelve wire. Safe access ladders shall be provided. Whenever people are working or

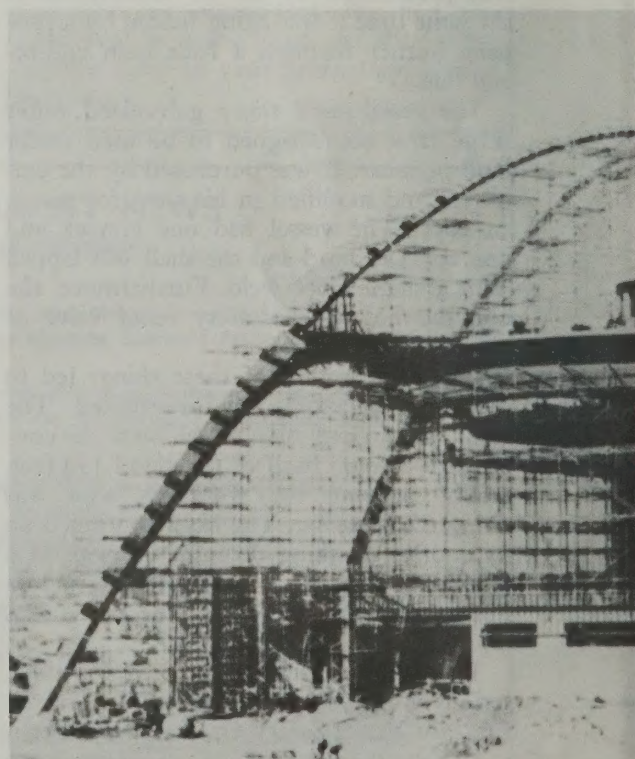
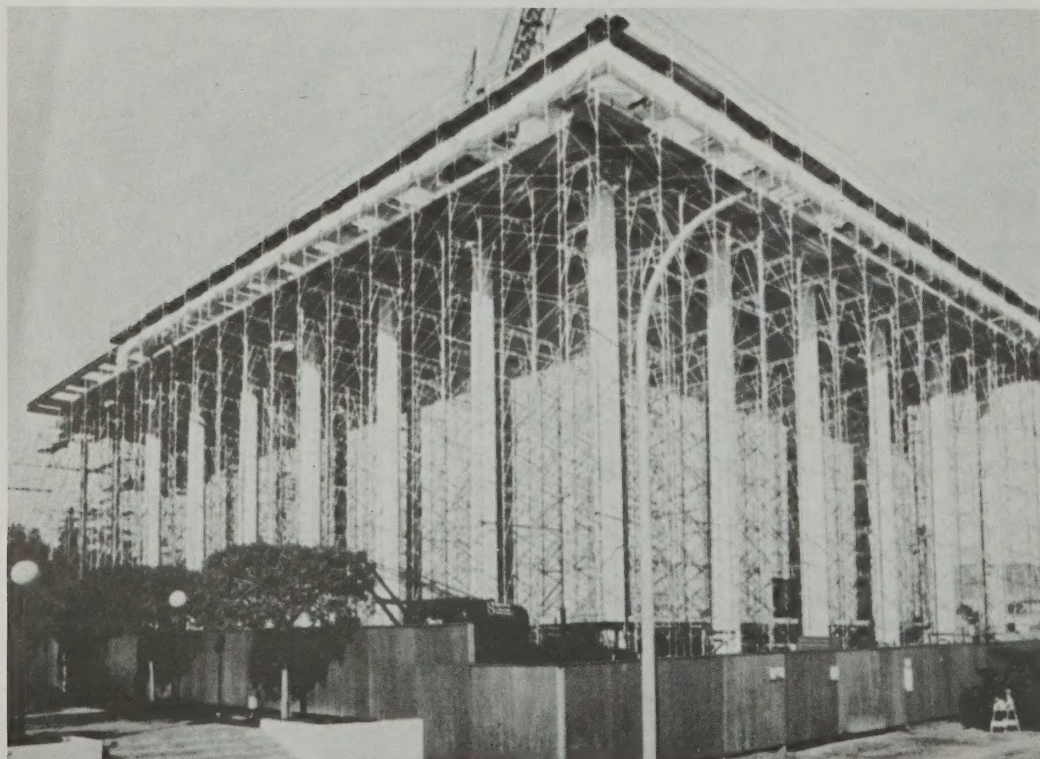
walking under scaffold work areas, wire mesh shall enclose the scaffold platforms. Most important, scaffolds shall be built from a solid foundation with adequate bases and pads on the bottom.

Every construction job has rolling scaffolds. Rolling towers must have one third of their total height as their smallest base dimension if they are to be a free-standing tower. California and OSHA laws stipulate that men may ride a rolling scaffold if the smallest base dimension is one half the height. However, I strongly recommend no riders when any rolling tower is being moved.

In an instance, not too long ago, three electricians were pulling conduit inside a building while they were riding a fifteen foot high rolling tower, pulling the tower along the floor by grasping the sprinkler lines along the ceiling. The one inch piece of conduit on the floor stopped the scaffold. Two of the men climbed down the scaffold and proceeded to lift it up over the conduit. The result? The scaffold tipped over severely injuring the man at the top—who was then at the bottom. Although the employer had to pay the workmen's compensation claim, the scaffolding supplier was sued also. None the less, rolling scaffolds properly erected to conform to manufacturers specifications and California OSHA regulations can be an invaluable aid to contractors and his subs. Whenever you can roll scaffolds instead of having to build scaffolds up into place, you can save money.

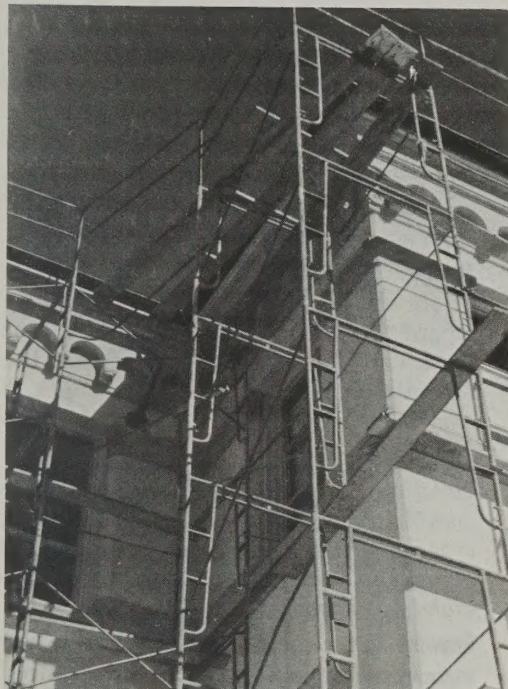


The suspended scaffold or swing stage probably enjoys the dubious distinction of being classified as the most hazardous of all scaffolding equipment. There are several types: electric, air powered, manually operated cable machines, and rope falls. Nearly all hang from davits, trollies, outrigger beams or railings. We inspected one installation erected by the sub-contractor and found that he had counter weighted the outriggering I-beams on the roof with a tool



FOLDING SAFETY

Patent Scaffold Co.



Substandard scaffolding.

box. The men working on this scaffold were just about a chain saw away from a quick trip to the bargain basement.

In regards to suspended scaffoldings, every company should have a man responsible for inspection of the equipment, life lines, safety belts, cables and electric cords, in addition to platforms, toe boards, guard rails and mid rails. Whenever using a swing stage, always use two anchoring machines and stirrups for each single platform. Do

not use two platforms with three machines and do not bridge between stages. Most important of all, make absolutely certain your stage is secured to solid anchorage, at the roof or parapet of the building.

Workmen's compensation rates are going up every year. Third party law suits are increasing at an alarming rate. For example, do you know that you are liable if your crews loan a rolling tower or a swing stage to another sub-contractor's crew for a few minutes and an accident results? You are also liable if you use two different brands of scaffolding together and an accident results.

Now the word is out, and the word is OSHA. The Williams Steiger Occupational Safety and Health Act of 1970 simply construed means that safety is now a federal law. The California State Division of Industrial Safety consolidated with OSHA to provide a solid one-two punch organization which has the power to stop work on a job, merit out fines and even send people to jail if safety infractions on jobs are not remedied. It has been resolved that these sharp-eyed gentlemen from OSHA in the California Division of Industrial Safety will see to it that we do our housekeeping and that our construction projects remain in good order with particular regard to safety.

Let's briefly sum up a few points. Get the copies of OSHA regulations and read those sections that apply to you. The Construction Safety Orders of the Division of Industrial Safety may be obtained from Di-

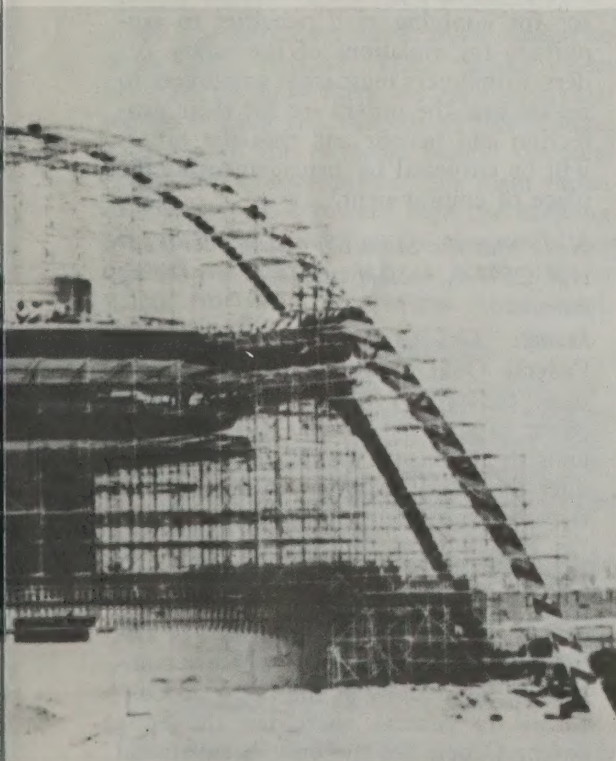
vision district offices or the Documents Section in Sacramento.

Remember that the strongest and safest scaffold can be involved in an accident if used or installed improperly or carelessly. You have the obligation to instruct your employees in the safe usage of scaffolds by whatever means is available to you. That would include talks, demonstrations, manufacturers safety rules and instructions.

Would you personally work on the scaffolding that you send to the job? Never use equipment which appears to be damaged or which becomes damaged while in use. If the job involves an unusual use of standard scaffolding equipment, get a design or layout drawing for the specific use you have. Most scaffolding accidents occur when men are left to install equipment by themselves without proper supervision or instructions.

When I first began to work with scaffolding, more than 20 years ago, I used to think that scaffolding was something that someone thought of at the last moment to provide access along the walls on the side of the building. I have come to know that it is a vitally important specialized field in all types of construction.

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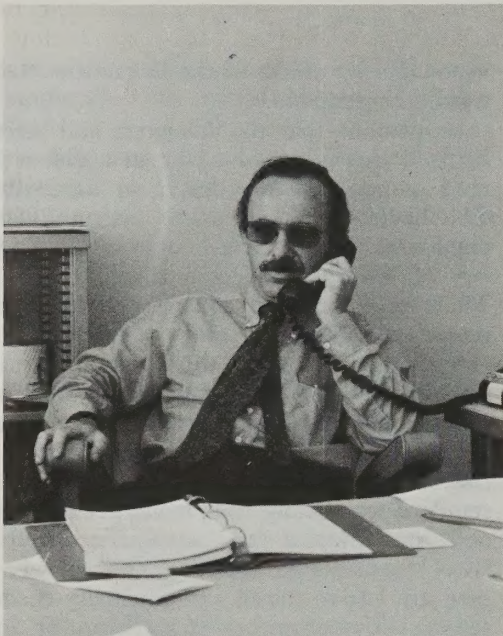


What's wrong with the picture?

1. Not enough platform for the proximity of guardrails.
 2. Guardrails inadequate.
 3. No safe access.
 4. Inadequate cross bracing in structure.
 5. Scaffolding built around electrical lead-in.
 6. No tie into building.
 7. Structure too far from wall.
- Planking is grossly inadequate in this structure.



SCHNEIDER APPOINTED ASSISTANT TO DIS CHIEF



Michael M. Schneider, new DIS Assistant Chief

Michael M. Schneider has recently been appointed Assistant to the Chief of the Division of Industrial Safety. One of his major responsibilities is to assist the Chief in his dealings with working people. He will be meeting with working people throughout the state in order to learn how

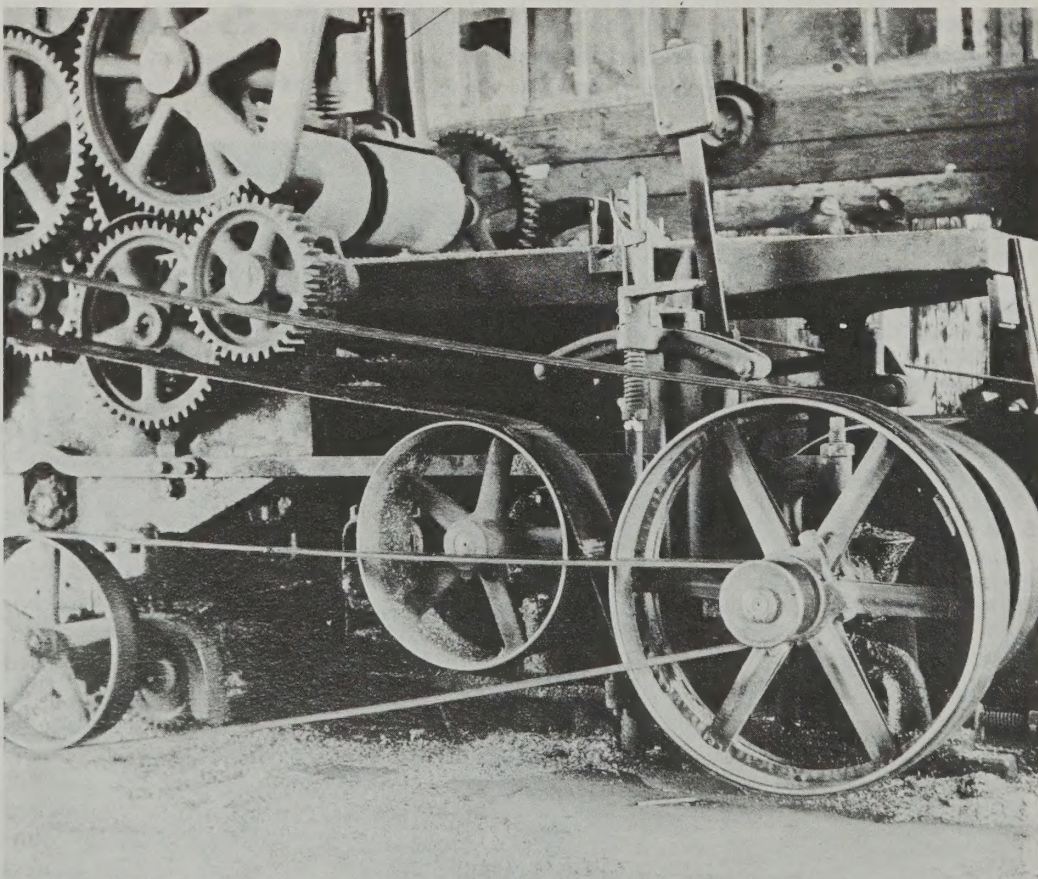
they feel the Division can ensure a safe and healthful working environment for workers, and better acquaint them with the role of the DIS. Schneider will also suggest ways in which organized labor can have a greater impact on the occupational safety and health of its members.

A native of New York, Schneider is 47 years old, married, and has two children. He is a member and a former president of the International Brotherhood of Electrical Workers, Local #6. Since 1951, he has worked for various San Francisco contractors as an electrician or electrical foreman.

Most recently, Schneider was in the office of San Francisco's mayor as a staff planner in the Office of Economic Development and Manpower Planning. His primary assignment was that of liaison between trade unions and the Mayor's office.

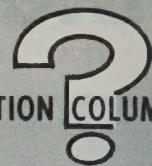
"Labor is sometimes reluctant to come to government with its safety and health problems," says Schneider. "Union members frequently say they don't know who to contact or that government will not intervene and support them in the solution of their day to day problems. Whatever the obstacles, the Division must be responsive to the legitimate needs of working men and women and therefore must solicit their advice and cooperation."

"GUARD IT!" WHO WOULD WANT TO STEAL IT?



There wasn't anything funny about this piece of equipment—in use in the early part of the century. Belts and gears still maim and kill workers despite the fact that the safety orders require that they be guarded. Are you protected from the gears and belts on your job site?

CAL OSHA



QUESTION COLUMN

1. Do scaffold installations have to be approved by the Division of Industrial Safety?

Answer: On scaffolds over 75 feet in height the Division shall be contacted in regard to the proposed design so that there will be ample opportunity for the Division to call for necessary changes, if any, prior to use.

2. Where are citations to be posted for violations in operations that have been completed before receipt of the citation, especially where the operations are not being conducted in the area where the violations occurred?

Answer: Post notices of violations in the same general location that the required poster is displayed. Only citations of serious violations must be posted at or near the location of the violation. If there are no further operations or employees at or near the location where the serious violation occurred, it too may be posted for at least three days at the location of the displayed poster. Guidelines for posting poster and citations will be forthcoming from the Division of Industrial Safety.

6. Can employees be penalized if they do not comply with the OSHA program?

Answer: There are no provisions in the act for applying civil penalties to employees for violations of the safety orders. Employers must train employees to realize that the orders are for their protection and benefit and that the orders will be enforced by management at the place of employment.

7. Now that the State has taken over Federal OSHA, which standards are being enforced?

Answer: The "State" has not taken over Federal OSHA. The Federal Occupational Safety and Health Act remains in effect in all fifty states. This law contains the provision that States may conduct the safety program enforcement if they demonstrate that their program is "as effective" as the Federal Program. However, since the State of California put the penalty program into effect on January 2, 1974, the Department of Labor has agreed not to originate any compliance inspections in the State of California. In general, therefore, the State Safety Orders are the only occupational safety orders being enforced in California.

ELEVATOR CONTROL IN FIRE OR OTHER EMERGENCIES

By Dan R. Dale
Compliance Safety Engineer
Division of Industrial Safety



The California Elevator Safety Orders, Section 3041(c), have been changed to include emergency service features similar to those in the A.N.S.I. A17.17 Safety Code, Section 211. Since there has been some controversy about the wisdom of this change, a review of the rationale behind the new orders seems appropriate. The main thrust of the revision is toward high rise building fires, but the provisions are also useful for other emergencies such as bomb threats where emergency evacuation is indicated.

ELEVATORS UNSAFE IN EMERGENCIES

First, why not let elevators operate normally so that people threatened by fire can use them to escape from the danger area? The NFPA Life Safety Code, Section A-5-113, summarizes the basic objections to use of elevators as emergency exits:

- (a) Persons seeking to escape from a fire by means of an elevator may have to wait at the elevator door for some time, during which they may be exposed to fire or smoke, or panic may develop.
- (b) Automatic elevators respond to the pressing of buttons in such a way that it would be quite possible for an elevator in use for descent from

floors above a fire to stop automatically at the floor involved in the fire and the doors to open automatically exposing occupants to fire and smoke.

- (c) Modern elevators cannot start until doors are fully closed. A large number of people seeking to crowd into an elevator in case of emergency might make it impossible to start.
- (d) Any power failure, such as the burning out of electric supply cables during a fire, may render the elevators inoperative or might result in trapping persons in elevators stopped between floors. Under fire conditions there might not be time to permit rescue of trapped occupants through emergency escape hatches or doors.

Seconds count in some instances. Even if a person remains totally rational while waiting for an elevator, alternate escape routes may be cut off by toxic products of combustion accumulating in passageways, by doors protecting passageways being opened to fire involved areas, or numerous other events that a totally rational and alert person has no way of knowing about. The elevator may never arrive.

Make the very generous assumption that a person does wait for an elevator, that there is no power failure to the elevator, no equipment malfunction or water or fire damage to stop the elevator, and no panic-stricken crowd to keep the elevator from functioning normally. He congratulates himself for keeping calm, perhaps gives a sigh of relief, steps into the elevator car, and presses the ground floor button. The odds are intolerably high that the elevator will not deliver the passenger to safety but to death.

FATAL DELIVERY

This fatal delivery to a fire-involved floor can occur in a number of ways:

- (a) An elevator passenger presses the car button for the involved floor.
- (b) Someone at the involved floor presses a "down" button while trying to escape the fire; he may perish there or leave by stairway before the elevator arrives.
- (c) Someone at the involved floor presses both "down" and "up" buttons, trying to get away from that floor in any direction. He may ride the elevator up and then be exposed to the floor again when the elevator stops in response to the "down" call that he registered.
- (d) Heat may melt or deform the buttons or wiring at the involved floor so that a call is registered.
- (e) Normally functioning controls for a bank of elevators may by chance cause a car to stop at the involved floor and open its doors.

Once a car stops at a heavily fire-involved

floor it is not likely to leave because the heat will probably cause the elevator to malfunction after the doors open. Following a fire, it is not unusual to find several inoperative elevators at the involved floors.

HOWEVER . . .

Elevators are not, however, simply treacherous servants waiting to betray us when we really need them. The NFPA Code goes on to point the way:

Notwithstanding the above limitations of elevators for emergency exit purposes, they may serve an important function as a supplemental facility, particularly in occupancies such as hospitals. Elevators are also important for very high buildings or deep underground spaces where travel over considerable vertical distance on stairs might be such as to cause collapse of persons not accustomed to such physical effort before they reach the street.

In such cases required exits such as stairs or horizontal exits may be used for initial escape from the area of immediate danger in a fire, and elevators used to complete the travel to the street.

While elevators operating in the usual way are unsafe in emergencies, they can be very useful if properly controlled.

EMERGENCY SERVICE PROVISIONS

The first concern with elevators in an emergency is to stop normal operation. When an "EMERGENCY SERVICE" key switch at the main floor is operated to the "On" position, elevators immediately close their doors and travel nonstop to the main floor if stopped at a floor with doors open, or continue nonstop to the main floor if already moving in that direction, or stop and reverse without opening doors if moving away from the main floor. If an elevator is on "Attendant Operation," a signal in the car tells the operator to return to the main floor. The same sequence is initiated if one of the heat or products-of-combustion sensing devices required at each elevator landing is activated. Sensing devices are not always required, for instance in a building with a complete sprinkler system.

When an elevator has been taken from normal service and brought to the main floor it is no longer hazardous, but it isn't useful either; the orders further provide for emergency elevator operation by responsible persons. The key used to park elevators at the main floor can also be used in the elevator car to operate a key switch which permits the elevator to be operated from the car only. In this emergency operating mode the elevator will not respond to hall button calls or operate doors automatically; it is completely controlled by the emergency service professional in the car. He can make on the spot decisions as to what he can safely do with

Continued on page 8



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Elevators, continued.

the elevator, and he has the knowledge and equipment to escape from the car if the elevator fails.

Because the major fire hazards for elevators are associated with automatic-power-operated hoistway doors in high-rise buildings, the new orders do not apply to those automatic elevators having manually-operated hoistway doors, or to existing elevators with travel less than 50 feet, or to new elevators with travel less than 25 feet.

CONCLUSION

Elevators enjoy the deserved reputation of being the safest means of travel available. The new orders governing emergency service provisions increase safety, by controlling the use of elevators when they are most vulnerable.

The message for the public is clear. *Do not attempt to escape fire by taking an elevator*, unless directed to do so by a safety professional on the spot. More important, *plan and practice emergency exit routes* before the need occurs. As with many safety admonitions, these are simple precautions which may mean the difference between life and death.

Pesticides are Training Topic

A two day course entitled "Occupational Health Aspects of Pesticides" was given to DIS compliance safety engineers recently by Department of Health and Division of Industrial Safety personnel. The training was designed to increase the engineers' awareness of the health hazards of pesticides.

Some of the symptoms of pesticide poisoning were described, as were various medical diagnostic tests. Dr. Erma West, MD, emphasized that non-medical people should not dispense or recommend drugs, treatment, nor should they make any type of diagnosis. They should also not attempt to evaluate any tests. They should get the facts for the doctor—not interpret them.

Dr. West discussed the ways in which pesticides harm humans. People are injured via:

1. systemic poisoning
2. adverse effects on skin and eyes
3. allergies
4. mutagenic effect
5. teratogenic effect

Pesticides can be as lethal when they

enter the body through the skin as they would be if they were injected into the veins. A suspected victim of pesticide poisoning should be given immediate first aid by a trained person. An emergency plan to deal with victims of pesticide poisoning must be established before a crisis.

A person remains vulnerable to pesticide poisoning even after s/he has recovered from a previous bout and should be monitored carefully for a possible recurrence.

The second day of the seminar was devoted to the General Industry Safety Orders as they applied to agriculture. John Meyers and Richard Drew of DIS presented practical problems and solutions which arise in agriculture inspections.

It is recommended that employers and employees working in agriculture study the sections which apply to them of the California Administrative Code (CAC), Title III and the General Industry Safety Orders (GISO). If pesticides are used in the operation, particular attention should be given to Article 23, Farm Worker Safety of the CAC and Article 13, Agricultural Operations, in the GISO.

From

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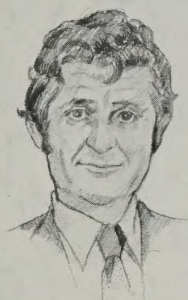


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SEPTEMBER 1975

Dave Chambers—On Safety



The Division of Industrial Safety has the total responsibility of ensuring that work places are safe for California employees. Though one can only speculate as to the number of accidents prevented by the diligence of division personnel, the number of occupational accidents and illnesses which occur is staggering.

Last year there were over 700 work related deaths in California, over 27000 lost time injuries, and nearly a million on-the-job accidents reported to the State Division of Labor Statistics and Research. Many of these deaths, illnesses, and accidents were the result of violations of the Labor Code. As long as workers lose their lives, their health, or are injured on the job, the top priority of the division must be its compliance function—enforcing the state occupational safety and health orders.

A comprehensive program is underway to free the division's compliance safety engineers from unnecessary paperwork so that s/he may spend more time inspecting workplaces. An on-site citation form is being prepared which the compliance safety engineer will be able to issue at the time a violation is discovered. Several other forms have been combined and some eliminated. Streamlining the total paper flow will not only increase the amount of time the compliance safety engineer spends in the field, it will make the support staff more efficient by reducing paper shuffling.

Compliance safety engineers will attend an intensive in-service training class in safety and health hazard identification. This auxiliary training will promote more uniform and thorough inspections among the engineers. In addition to classroom training, the safety compliance engineers will be given practical field instruction in recognizing and

responding to hazards on the job. Federal facilities will be used as a training ground for field work.

In the past, if a complaint were received by the division, the worksite it involved would automatically be given a wall-to-wall inspection—even if the complaint proved groundless and the rest of the shop appeared hazard free. Each inspection involves an average of 6 hours of the safety compliance engineers' time—either in hours on the site or paperwork in the office. Inspecting these work places routinely meant that many hazardous sites were being neglected. Consequently, our policy has changed.

Wall-to-wall inspections will not always be made as a result of a complaint. If a complaint is received and the engineer, upon investigating the particular problem, does not consider it necessary at that time to conduct a wall-to-wall, s/he may elect not to do so. Once again, more efficient use will be made of the safety compliance engineer's time.

The division plans to work closely with labor and management in promoting voluntary compliance with the safety and health orders. Union members will be given job hazard identification training upon request. Logically, unions can assist their demands that employers maintain safe workplaces by negotiating a clause in their contracts which stipulates that the employer must comply with all safety and health orders of the state.

Management—and particularly small industry—will receive safety training from division personnel upon request. Employers should not be afraid to call the division for safety consultation or advice. A call to our consultant staff will not under any circumstances trigger a compliance investigation. Safety is the end product of the division. Our aim is to achieve safety for California workers without punitive action. Only employers who maintain unsafe workplaces

THE LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN Continued on page 2.

Temporary Variances Denied

Temporary variances have recently been denied by the Appeals Board regarding the use of the short-handled hoe.

Temporary variances may be granted only under very specific circumstances.

Long-handled hoes were available to the

growers and one of the considerations for the issuance of a temporary variance is that the proper equipment is not available. Consequently, the temporary variances were denied.



Farm workers using long-handled hoes as they would short-handled ones. Workers should be instructed in the use of the long-handled hoe and warned of the dangers of continuing to use the short-handled stance. Note workers in background using hoes properly. (Photo courtesy of Sacramento Bee.)

Chambers, Continued

need be afraid of the penalty assessing powers of the division.

The cost of safety for California's work force of 8.5 million employees is less than \$1.30 per year for each member. That small sum provides employers and employees with the protection of the safety orders as well as recourse if the labor code is violated. The division is interested in giving Californians the most for their money. We hope to achieve this goal by making more efficient use of our personnel's time and by conducting educational programs which will have the most direct effect upon safety.

We get letters . . .

The Division of Industrial Safety frequently receives letters which commend members of its staff. The following is a good example of the way some employers have improved their opinion of the Division after encountering it first hand.

"We have been visited by compliance safety engineers from Cal/OSHA on two occasions this year. I think that their superiors should know that on both occasions I found these compliance officers to be real gentlemen, doing their work in a very thorough, business-like manner. Both of these visits helped to shatter all of the misleading rumors about Cal/OSHA."

"Our employees feel good knowing that

both their employer and Cal/OSHA are working together for their safety."

*Michael Golding, President
COOLAIR Mfg. Corp.*

The division employs bilingual compliance safety engineers who give safety talks in Spanish periodically. Below is a letter received recently about a safety program conducted by one of our compliance men.

"Thank you for the outstanding program on Safe Handling and Use of Butane and Propane which you gave. It was exceptionally well done and clearly presented. The material, which I have learned is difficult to find in Spanish, was so right for the situation. The many hours of research and planning that you spent were clearly evident. Inviting a man to bring a tank and valve samples was very beneficial."

"Obtaining specialists to present educational programs has been the secret of the success of Project Call, but we can only succeed through the efforts of individuals like yourself who donate so much time and attention to the needs of the community."

"The men understood you so readily that



I'm sure you are too modest about your Spanish vocabulary."

"It was a privilege to work with you and I am looking forward to your program in English."

*Marion Staton
Project Call
Taft College*

YOU CAN'T AFFORD TO TAKE A VACATION



From Safety

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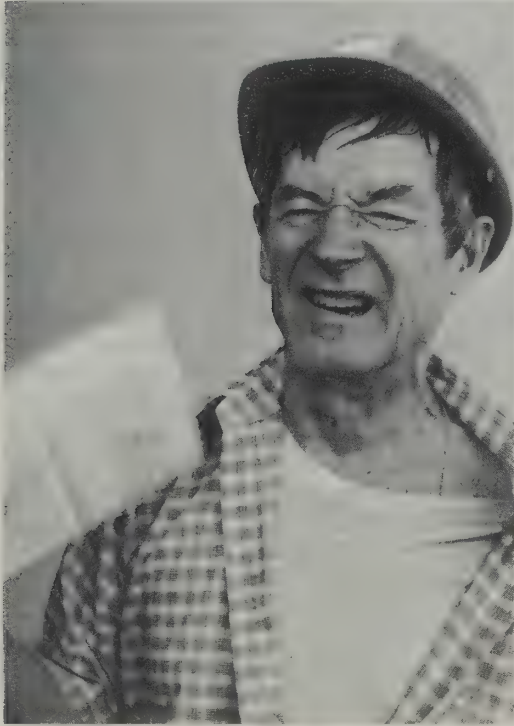
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Wear your hard hat!



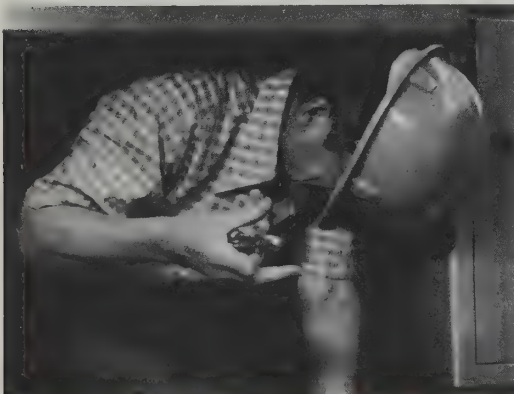
Getting workers to wear hard hats is not always easy. Various excuses are given by workers who go bare headed:



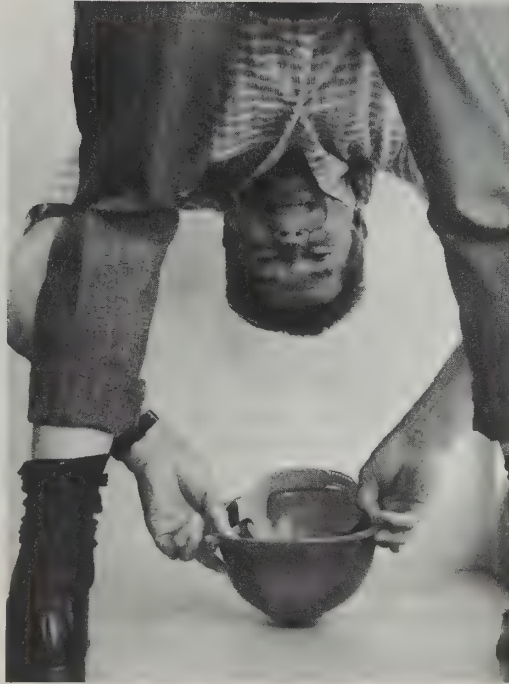
1. It's too hot.



2. Makes my head ache.



3. Cumbersome to wear in confined spaces.



by Earl Evans, DIS Safety Engineer, Retired

4. Hat keeps falling off when bending or stooping.
5. Not always exposed to flying or falling objects. For instance, work is performed inside buildings under construction.

If a hard hat is properly selected and fitted, the first four objections are readily overcome. The logical response to number five is that head protection must be worn because there is a danger from flying and falling objects at other locations on the worksite. The worker may find himself in the danger areas during the shift, even though he/she is not actually working in a hazardous area. A worker probably would not be reluctant to wear head protection in areas where it is theoretically unnecessary if the equipment were comfortable and attractive.

The selection, fit, and effectiveness of head protection by large determine whether it will be worn without resistance.

EFFECTIVENESS

The effectiveness of head protection depends upon its engineered suspension system. There must be adequate clearance between the top of a worker's head and the helmet shell. The impact-resistance of the headgear, its suspension system and the crown clearance determines the amount of protection offered against impact and penetration. All suspensions should have a fixed crown, but may also have an adjustable crown, one designed to tilt or swivel.

Care of Headgear

Damaged headgear should be replaced immediately.

Nothing should be placed inside head apparel, such as a pack of cigarettes. Such items will interfere with the shock-absorbing features of the suspension system. The interior must also be free from projections, such as metal fasteners, or scalp injury may result.

Holes should not be bored in the crown in an effort to make the headgear cooler. This modification destroys the hat's dielectric strength, as well as the shell's ability to withstand the maximum impact of falling objects.

Caution should be exercised in painting any shell, especially dielectric types, as it may affect the protection offered by such gear. Consult the manufacturer with respect to choice of paints for any type of headgear.

Safety hats or caps should not be placed on the rear window shelf of an auto or truck; sunlight may affect their protective quality, or in emergency stops the gear can become a hazardous missile. Storage racks are available for autos and trucks.

If the gear becomes dirty or worn, the entire cradle assembly, including the sweatband, and the shell can be washed with lukewarm, sudsy water. The chin strap and cradle assembly can be replaced. The entire unit usually can be sterilized by dipping in 140 degree (F) water for three minutes, or by rinsing in disinfecting solution. The manufacturer's instructions should be followed. Harsh solvents may remove any applied decals.

SELECTION

Head protection must be selected to meet the demands of the job. For instance a heavy, bulky hard hat would not usually be well suited to work in confined spaces.

It should provide maximum shock absorption and minimum shock transmission. Heat and electric conductivity should be minimal and it should be self-extinguishing.

Colors should be permanently impregnated in the shell for color coding. It should possess optimum non-aging characteristics.

Cleaning and changing the suspension should be simple and economical. It should be attractive, comfortable, and light weight (no more than 14 ozs.).

Accessories

Available accessories include hearing protectors, microphones, face and eye shields, sweat bands, chin straps, nape straps, lamp brackets, goggle mounts, winter liners, and identifying decals. Make sure such items are interchangeable on different types of headgear.

ANSI Helmet Types and Classes

The construction of the headgear shell and the suspension must meet American

Continued on page 4.

Hard Hats, Continued

National Standard Z89.1-1969 (ANSI). They are divided into two different types:

1. Helmet, full brim.
2. Helmet, brimless with peak.

They are also divided into four different classes according to the exposure limits.

Class A General Service (2,200 volts)	Class B High Voltage Protection (20,000 volts)
Class C Limited Service (No voltage)	Class D Fire Fighters Service

FIT

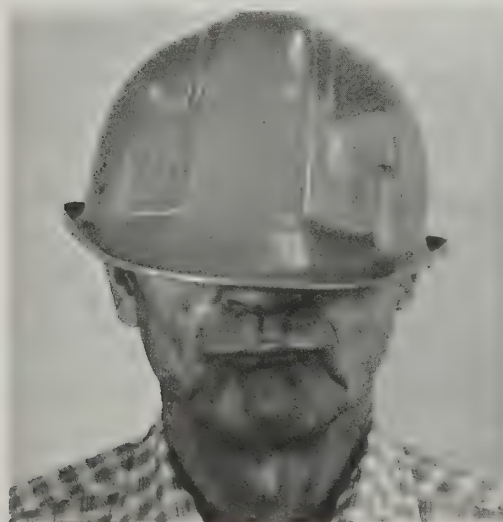
There should be at least an inch between the crown straps of a hard hat, and the shell crown. The wearer's head should meet the inner suspension at the crown squarely and the head band should be above the ears.

A hard hat should fit securely enough so that it does not drop off while the worker is stooping. A chin strap may be added if the hard hat does not fit securely enough for the worker's comfort. There should be adequate space between the head band and hard hat shell to permit air circulation.

If workers refuse to wear hard hats that fit well, are effective, and appropriate for



TOO SMALL



TOO LARGE

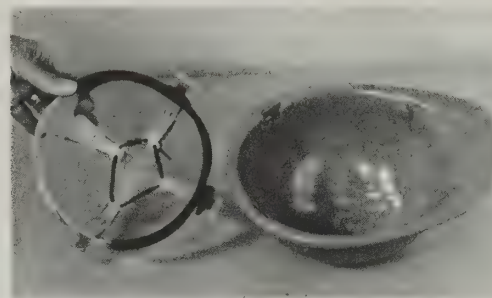


JUST RIGHT

their work, the following actions might be taken:

1. Dismiss or layoff all workers found not wearing hard hats when they have been warned about it before.
2. Subject workers to fines by union representatives if union by-laws permit.
3. Install hat racks at entrance and exit of building so worker can check hat when entering and pick it up when leaving.
4. Promote wearing of hard hat as a status symbol using varying colors and combination of colors designating each trade, and awarding special decals to paste on hat for every three months worked without a loss time injury.

Hard hats are useless unless they are worn. It is the employee's moral responsibility to his/her health and family to protect his/herself from injury. It is the employer's legal responsibility as well as moral obligation to guard the safety of employees.



Hard hat suspension system acts as a shock absorber.

DIS AIDS POLICE IN RETURNING STOLEN AIR COMPRESSOR

The San Francisco Pressure Vessel Staff recently came to the aid of the San Diego Division of the California Highway Patrol and the San Diego Police Department by helping to locate the rightful owner of a stolen portable air compressor. The thieves could not recall from whom it had been stolen.

The portable air compressor had been stolen in 1973. The thieves had removed the license plate and the vehicle I.D. number. Also it had been repainted. The only I.D. remaining was the air tank state serial number assigned by the Division of Industrial Safety inspector. This state number was reported to the San Diego Police Department when the air tank was stolen in 1973. The state number was entered into the stolen vehicle computer system in the San Diego area, State of California and nationally in Washington, D.C.

When the portable air tank was recovered by the California Division of Highway Patrol, Police Sergeant R. R. Guerrero telephoned the San Francisco Pressure Vessel Staff of the Division with the state serial number. The inspection report with the owners' name was located by the Division. The owner listed on the inspection report was found, but he informed the police that he had sold the compressor before it had been stolen. The police contacted the man to whom it had been sold and the compressor was returned to him.

In the future, DIS safety engineers are being requested to include in their inspection reports the DMV license number of units which have licenses. In that way, even if a piece of equipment has changed hands several times since its last inspection, the owner can be located by the DMV license number on the report.

Cal/OSHA Poster Reprinted OLDER VERSION STILL OK

The California Occupational Safety and Health poster has been reprinted with minor word changes. Either the new edition or the older version of the poster must be displayed conspicuously in all places of employment in California. A place of employment not posting the document may be fined up to \$1000.00 by the Division of Industrial Safety.

The Division recommends that employers protect the poster by placing it under plastic or glass. Without exception, both Spanish and English parts of the poster must be displayed.

Reproductions or facsimiles of the State poster fulfill State posting requirements if they are at least 8½ inches by 14 inches, and the printing size is at least 10 point. Whenever the size of the poster increases, the print size must increase accordingly. The caption or heading on the poster must be large type, generally not less than 36 point.

Not smelling a 'rotten egg' can be dangerous....

By Vernon L. Larson
Safety Engineer
Division of Industrial Safety

It has become increasingly apparent lately that many people in the well servicing and petroleum industry are unaware of the dangers of hydrogen sulfide gas (H_2S). This seems particularly true where workers enter confined spaces. Lately Division of Industrial Safety personnel have come across appalling situations which are the result of oil industry personnel's lack of knowledge about hydrogen sulfide gas. Some rigs have no safety devices nor program for resuscitation.

Contrary to "common knowledge" H_2S can *not* always be smelled. Unfortunately, some oil industry management personnel are telling their workers that there is no problem in detecting H_2S gas by its characteristic rotten egg smell before it gets strong enough to kill. This is simply *not* true. A person's olfactory (nose) sense only detects H_2S gas up to a limit value of about 100 ppm; above this concentration, the olfactory senses are deadened by the gas in minutes. H_2S can cause even the strongest man to become unconscious in 30 seconds at 1000 ppm (about 0.1% on a volume basis).

It is colorless, its specific gravity is 1.17 times heavier than air; it readily attacks nerve tissue, causes immediate respiratory distress and possibly stoppage of the breathing rhythm at 500 ppm; it is non-corrosive to most metals.

Breathing H_2S for even short periods can result in chemical pneumonia. Recovery can be lengthy, sometimes taking several weeks or more in an intensive care ward before the patient's lungs clear of fluid and distress symptoms.

In addition, this gas is explosive. The explosive range is extensive, starting at a lower explosive limit of 4.3% (by volume) to 46% upper explosive limit.

According to Petroleum Extension Service, University of Texas at Austin, toxicity of H_2S is:



Another misconception is that H_2S occurs only in certain oilfields and not in others; therefore the use of safety devices or a strict safety program need not be necessary in all fields. Although the presence of H_2S may be greater in one geographic area, it should not be construed that this or other lethal gases are not present in other areas. It is therefore very important that oilfield workers take precautions at all locations, particularly for the hazards of toxic gases.

To help prevent injury and death to those men who make oil recovery their living, it behooves management to insure the safety of its crews by observing several very useful rules.




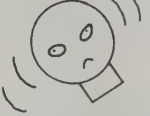

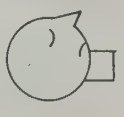
- (1) Use gas detecting equipment (vacuum pump or direct reading preferred) to check the concentration before sending men into vaults, cellars, or other confined spaces. Have trained people use such equipment.
- (2) Use gas detecting devices continuously while men are in confined spaces to insure that conditions have not changed.

- (3) When feasible, remove top cellar cover and provide blowers to dissipate and vent concentrations of trapped H_2S for 15 minutes before entering and during the time the employees are working in the confined space.
- (4) Have a top watch of at least one worker. In case of trouble involving the person in the confined space, the worker can assist in the rescue. The person in a confined space should use a safety harness and line.
- (5) Have available an approved type of self contained breathing apparatus.
- (6) Have available safety belt(s) and harness(es) for workers who enter confined spaces with the lifelines attached to fixed objects outside the confined space. In an emergency these lines can be used to pull a worker to safety.
- (7) Methane gas (CH_4) often occurs in areas where H_2S exists. Both have explosive qualities; therefore do not smoke immediately near or in the confined space.
- (8) Maintain an active safety program where at least *one* member of the crew is specialized in giving first aid treatment. All workers should know how to give resuscitation or artificial respiration.
- (9) Know the locations of the nearest phone and hospital.

Remember the wisdom of the old proverb, "Caution is the parent of safety." Hydrogen sulfide gas can be lethal. Respect its toxicity and treat it accordingly.



It is easier to do a thing right than to explain why you did it wrong.
(Reprinted from California Safety News, February, 1917.)

<p>10ppm = 1/1000 OF 1%</p>  <p>CAN SMELL. SAFE FOR 8 HOURS EXPOSURE.</p>	<p>100ppm = 1/100 OF 1%</p>  <p>KILLS SMELL IN 3 TO 15 MINUTES. MAY STING EYES AND THROAT.</p>
<p>200ppm = 2/100 OF 1%</p>  <p>KILLS SMELL SHORTLY. STINGS EYES AND THROAT.</p>	<p>500ppm = 5/100 OF 1%</p>  <p>LOSES SENSE OF REASONING AND BALANCE. RESPIRATORY PARALYSIS IN 30 TO 45 MINUTES. NEEDS PROMPT ARTIFICIAL RESUSCITATION. WILL BECOME UNCONSCIOUS QUICKLY (15 MINUTES MAXIMUM).</p>
<p>700ppm = 7/100 OF 1%</p>  <p>BREATHING WILL STOP AND DEATH RESULT. IF NOT RESCUED PROMPT-IMMEDIATE ARTIFICIAL RESUSCITATION.</p>	<p>1,000ppm = 1/10 OF 1%</p>  <p>UNCONSCIOUS AT ONCE. PERMANENT BRAIN DAMAGE MAY RESULT UNLESS RESCUED PROMPTLY.</p>

Wrecked Tank Emptied Via Product Burning



Wrecked liquid propane tanker. Vertical pipe in background was used for product burn-off.

Disaster was averted recently due to the well planned action of a local fire department and the Division of Industrial Safety. A liquid propane gas transport had become disengaged from its tractor and had rolled 100 feet down an embankment where it came to rest on a wide ledge directly under a producing oil well.

Fortunately the tank did not rupture. Division of Industrial Safety engineers reported that LP gas tanks seldom rupture because their construction is strictly regulated by the American Society of Mechanical Engineers (ASME). ASME standards require that tanks be designed to hold four times the pounds per square inch (psi) they actually carry.

A local Fire Department consulted the Division of Industrial Safety as to the best way to empty the tank of product before moving it. Division engineers visited the site and suggested that the tanks be emptied of product by burning. The burning proc-

ess, if not handled well, could have caused the oil well on the tank to ignite. The Division of Industrial Safety recommended the following procedures to avoid such a holocaust:

1. Install "rosebud" fitting at the top of the burn off stack to assist the flare combustion.
2. Install an excess flow valve in the $\frac{3}{4}$ -inch hose line where it connects to the $1\frac{1}{2}$ -inch reducing fitting from the tank.
3. Providing a "sniffer" for determining if any combustible gases are at the oil well located beneath the overturned transport.
4. Provide 24-hour surveillance per day when the flare is ignited until the tank is emptied of product.

The flare, connected by tubing to the tank, was located a safe distance from both the well and the tank. The transport was successfully emptied in the manner recommended without incident.

PAPER MACHINE DRYER ROLL EXPLODES

by Gerald Horn, Safety Engineer Division of Industrial Safety

A non-code, cast iron, paper steam dryer roll exploded recently causing serious damage to a paper mill. The incident shut down the plant, and production has still not resumed. Fortunately no one was injured.

A progressive crack around the entire circumference of the vessel shell adjacent to the bolted head attachment caused the explosion. This was noted from the oxidation of the crack in the ruptured area.

There were forty-two of these vessels in operation at the time of this accident. Seven vessels in the immediate area of the explosion were internally inspected and radiographed. Five of the seven were found to

be cracked and reduced in thickness from erosion by about 30%.

These rolls were built in 1920 and installed at the present plant in 1968 for service at a reduced pressure of 40 pounds per square inch (psi). The deterioration in six years of service could have been found before the explosion if the rolls had been internally inspected. There are also several methods of nondestructive examination that could have been used to detect cracking.

There have been many explosions of dryer rolls, some of which were catastrophic. Dryer rolls are under greater stress than most pressure vessels. They rotate at

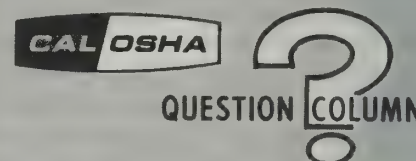
high speed, are subject to mechanical damage externally, and are subject to water hammer inside the roll from condensate.

Failure of dryer rolls usually occurs in the following areas of the cast iron rolls:

1. In the vicinity of the access openings.
2. In the heads near the junction of the trunnions.
3. In the shell adjacent to the bolted head attachment.

Welded rolls usually fail at the weld attaching the head to the shell.

Operators of such equipment should set up a program of periodic inspection. The program should include nondestructive examination of the areas which frequently fail.



1. What are the requirements for First Aid Kits?

Answer: First aid materials are required that are appropriate for the type of work and the accessibility of an infirmary, clinic, or hospital. The company's physician should prescribe the materials as per General Industry Safety Orders 3390 or Construction Safety Orders 1512.

2. What cranes require certification?

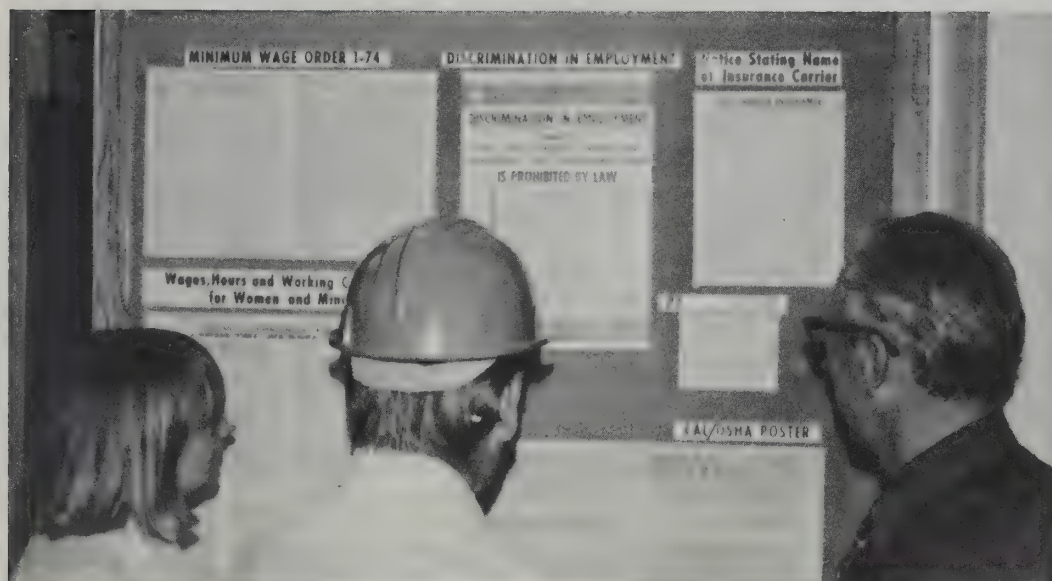
Answer: Those cranes and their accessory gear with a capacity in excess of three tons and engaged in lifting service. This also applies to derricks and cableways.

3. What initiates a compliance inspection at my places of employment?

Answer: District Managers assign field safety engineers to conduct surveys at places of employment using the following priorities:

1. Complaint from an employer, employee or legal representative of an employee concerning a possible imminent hazard.
2. Notification of an accident involving a fatal injury or injury of five or more persons.
3. Complaint from any source which the District Manager feels to be reliable which appears to involve an imminent hazard.
4. Complaint from an employer, employee or a legal representative of an employee involving nonserious violation of the safety orders.
5. Complaints from any other source the District Manager feels to be reliable; or reports of accidents less serious than those specified in item No. 2.
6. Routine inspections assigned by the District Manager.

POSTING REQUIREMENTS OF DIR



Employees examine notices required to be posted by the State.

Six basic notices are required to be posted by the State Department of Industrial Relations:

Division of Fair Employment Practices

1. Discrimination in Employment

This notice must be posted in hiring offices, employee bulletin boards, employment agency waiting rooms, union halls, etc.

Division of Labor Law Enforcement

2. Pay-Day Notice

Every employer shall keep posted. . . . at the place of work. . . . a notice specifying the regular pay days and the time and place of payment. . . .

Division of Industrial Welfare

3. Wages, Hours and Working Conditions for Women and Minors

Every employer shall keep a copy of this order posted in an area frequented by women and minors where it may be easily read during the work day.

There are 14 different orders and the one required to be posted depends upon the industry the employer is engaged in. Section 3 (Maximum Hours) and Section 17 (Weight lifting), which restrict women but not men, were found to conflict with the Civil Rights Act of 1964. They have been invalidated by a Federal Circuit Court decision and cannot be enforced.

4. Minimum Wage Order 1-74

Every employer shall keep a copy of this order posted in an area frequented by employees where it may be easily read during the work day. This order rescinds minimum wage and related Sections of Orders 1-68 through 14-68.

Department of Industrial Relations

5. Notice stating name of insurance carrier

Every employer. . . . shall post and keep posted at one of his places of employment a notice which shall state the name of the current compensation insurance carrier of such employer. . . .

Division of Industrial Safety

6. CAL/OSHA Poster

All employers shall. . . . post information regarding protection and obligations of employees under occupational safety and health laws. This poster must be prominently posted in all places of employment in the State of California. In addition, the following special notices are required to be posted by certain employers:

Division of Labor Law Enforcement—Farm Labor Contractor—Statement of Pay Rates

Pertains to farm labor contractors only. Must be prominently displayed on all jobs where employees are working and in any bus or truck in which employees are transported.

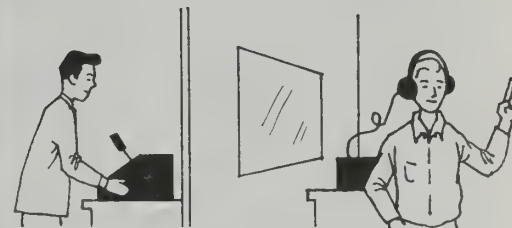
Division of Labor Statistics and Research OSHA Form 102

Must be posted from February 1st to March 1st at each establishment in the place where notices to employees are customarily posted.

Division of Industrial Welfare Tipping Notice

Certain businesses are permitted by law to credit gratuities as part of wages due the employee. In such cases, the employer must post this notice where it can easily be seen by the patrons.

Audiologists Regulations Reiterated



The Board of Medical Examiners recently reiterated in an announcement the established regulations for the measurement of hearing, including pure tone threshold procedures. Tests must be conducted by a licensed audiologist or by an individual registered as an aide to a licensed audiologist.

Individuals who are working in the public schools as public school audiometrists and who hold a certificate as a public school audiometrist pursuant to California Administrative Code Title 17, section 2950-51, the Veterans Administration, are excluded. Individuals working in physician's offices under the direct supervision of a licensed physician and surgeon are excepted as well. Direct supervision has been defined as supervision within the usual and customary office space of that physician who is conducting these procedures within the scope of his licensed profession.

Hearing test services should be offered only by those individuals who are identified as licensed audiologists or registered aides who work under the direct supervision of a licensed audiologist. A licensed audiologist holds a minimum of a Master's Degree in Audiology, 275 clock hours of supervised clinical experience, one year of required professional experience under the supervision of a licensed audiologist, and must pass a written examination. In order to assure professional consultation and services, industries should ascertain that the agency or group of individuals offering these services are legally qualified.

Those individuals who are serving as aides to a licensed audiologist must be registered with the Board of Medical Examiners, Department of Consumer Affairs, Speech Pathology and Audiology Examining Committee. Appropriate forms are available from Committee offices at 1020 N Street, Sacramento, California 95814 or by calling 916-322-5043. The ratio of aides per licensed audiologists is in the process of being established.

The licensed audiologist is legally responsible for the quality and professional standards of services conducted under his supervision. If there are problems regarding these services, professionally or legally, the licensed individual endangers his licensure status and his right to practice his profession in the State of California.

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5273
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
Panorama City	8155 Van Nuys Blvd. 91402	213-988-6141
Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

District Offices

Bakersfield	225A Chester Ave. 93301	805-324-6437
Concord	1070 Concord Ave. 94520	415-676-5333
El Monte	3415 Fletcher Ave. 91731	213-572-6960
Fresno	2550 Mariposa St. 93721	209-488-5273
Long Beach	230 E. Fourth St. 90802	213-432-8443
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-3861
Modesto	1800 Coffee Rd. 95355	209-529-7751

Oakland	1111 Jackson St. 94607	415-464-0660
Panorama City	8155 Van Nuys Blvd. 91402	213-782-1800
Redding	1421 Court St. 96001	916-246-1621
Sacramento	2422 Arden Way 95825	916-445-5818
Salinas	21 W. Laurel Dr. 93901	408-449-7235
San Bernardino	303 W. Third St. 92401	714-383-4321
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	3704 State St. 93105	805-682-2578
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
Vernon	2833 Leonis Blvd. 90058	213-589-5848

Field Offices

Chico	555 Rio Lindo Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
Ukiah	264 E. Smith St. 95482	707-462-8850
Ventura	5740 Ralston St. 93003	805-644-8219

New DIS Chief

David L. Chambers has been appointed Chief of the Division of Industrial Safety by Governor Brown. Chambers is the former president and director of District Lodge #50, International Association of Machinists and Aerospace Workers (IAM & AW) in San Diego. He has been in union work since 1951. A toolmaker by trade, he became involved in union work full time in 1959. Born in Portsmouth, Virginia, Chambers is 46 years old, married, and the father of four grown children.

Chambers sees as a primary goal the streamlining of the Division to make it more responsive to the needs of California workers. He plans on setting in motion procedures that will result in more efficient use of Division personnel.



David L. Chambers

Individual Safety Orders Sold by District Offices

The California safety orders may be purchased individually at any District Office of the Division of Industrial Safety (DIS). The amendment service to any individual safety order may be ordered from the Documents Section in Sacramento. A price list for the safety orders and information about the amendment service are available at all DIS District Offices. Office locations and phone numbers are listed on the back page of the California Safety News.

The safety orders in their entirety must be purchased through the Documents Section in Sacramento. Chapters 3.2, 3.3, 3.5, and 4 of Title 8 contain all of the safety orders enforced by the Division of Industrial Safety.

Documents Section
P.O. Box 20191
Sacramento, Calif. 95820

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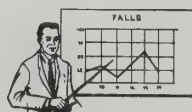
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APRIL 1975

PRESENTING USEFUL STATISTICS ON INJURIES



A well-known dictionary defines statistics as "systematic compilation of instances for the inference of general truths." This definition seems to satisfy the needs of the safety engineering profession, since safety engineers work best if they can establish some general truths regarding accidents in the plants or operations with which they are involved.

At the start of a safety program with a new operation, it may be necessary to rely upon general statistical information available from like operations. However, as local statistics begin to develop, the wise safety engineer takes full advantage of data at hand. He uses local statistical information to point up the areas and operations in need of special attention (which parts of the plant or operation have the most acute injury problems). He needs to have statistical guides to prevent him from forming faulty conclusions based upon memory or sketchy notes. He needs something that will allow him to look at and understand a whole group of similar accidents at once—something that will provide a quick and accurate view of the broad local accident picture.

This article will attempt to present a tabulation method that will give an accurate and clear view of the injury picture—one brief enough to submit to management along with, and as justification for, an accident prevention program. At the same time it presents some interesting data on the types of injuries and accidents that plague the painting industry.

Widely used and well defined standards are readily available for the classification of industrial accidents. The standards commonly used rely upon several well-established accident factors such as:

1. Nature of injury—a classification that separates the total into the various types of injuries involved—groups like burns, cuts, fractures, etc.
2. Accident type—which accumulates data according to the event resulting in injury, such as striking against, falls, caught in or between.
3. Agency—the unsafe object, substance or exposure involved in the accident.
4. Unsafe act—violation of a commonly accepted safe

procedure such as failure to tie or secure, over-reaching, or failure to use personal protective devices.

5. Unsafe mechanical or physical condition—such as an unguarded machine, or a ladder without safety shoes, etc., that contributed to the injury-producing event.
6. Unsafe personal factor—like defective hearing, absent-mindedness, or disregard of instruction.

Additional classifications are also used by safety engineers interested in knowing (and in having top management know) as much as possible about the injury picture. Classifications by occupation are sometimes of value, as are breakdowns that provide statistical data for each of the plant operations such as shipping, manufacturing, maintenance, sales, etc. Part of body injured, source of injury (often called agency of injury) and agency part are frequent additions.

The classifications for accidents are well-understood, widely-used, and of real value to the profession. What seems to be needed most is a way to combine them into a more usable package and to extend the knowledge gained from studying them into a program of corrective action.

If a single accident is investigated by a competent person, the report will usually identify each of the six accident factors and probably several more. The report reader will gain a clear picture of the important facts leading to the resulting injury. However, when an attempt is made to combine a number of such reports into

(Continued on Page 2)



CHIEFLY SPEAKING

Richard Wilkins

Great progress has been made towards completing the modifications in the State safety and health program which the federal government required when it approved the California Occupational Safety and Health Plan.

The Division of Industrial Safety has been busy applying its technical expertise to a comparison between federal and State occupational safety standards. The

(Continued on Page 7)

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a statistical summary, much of the clearness and detail is lost. Is it necessary to lose so much? Should we allow ourselves to be limited to commonly used tabular presentations?

A simple statistical record might consist of little more than several lists. One list might give the number of injuries involved with each accident type; another, the injuries by agency; etc. By referring to list of accidents by type one quickly learns how many workers were injured from falls; but from what they fell is not clear unless two of the lists are combined. This is easily done and improves the picture somewhat—which is the reason that most tabulations combine at least two of the accident factors into one table. Agencies can, for example, be listed in a column on the left hand side of a graph and the accident types as column headings across the top, giving answers such as the number of falls there were from ladders. Most safety engineers use various combinations such as this, but it is difficult to combine into a single table more than two or three of the several accident factors.

From a double-factor table it might be noticed, for example, that there were ten falls from ladders, and in another table that five falls resulted from taking an unsafe position. Immediately the question comes to mind; how many of the five were among the ten. How many of the ladder falls resulted from taking an unsafe position? We have all tried turning to a third table in order to get the answer and sometimes it can be done. However, it is not easy to do and by the time a fair answer has been developed, the frustrated reader of statistics (usually the boss) may have forgotten why he wanted to know.

Various tabulation systems have been developed for inserting additional accident-report detail into the statistical tabulation. One system has been developed which, for obvious reasons, is called "The Pyramid". (See accompanying sample.) It is not adaptable to all plants or operations, but seems to work well wherever the accident group to be covered involves only a limited number of agencies, unsafe acts and hazardous conditions. If numerous agencies and unsafe factors are involved, the tabulation begins to spread and become less compact, but a larger sheet of paper will sometimes solve the problem. This presentation attempts to give on one page and in one chart, a good picture of the accident prevention problems in need of solution. It groups like accidents together and tells us how many accidents happened in about the same way; how many accidents involved certain behavior patterns, similar conditions, types of equipment or results. Most important of all, it points to what types of corrective action should be taken, which of course is what safety is all about.

The sample presented here applies the Pyramid to 56 disabling injuries to painters employed by various painting contractors in California. A special program accomplished the investigation of all known painter injuries occurring in a sizeable area of California within a period of one month, thus obtaining a near-typical cross section of injuries to painters. As would be expected, it shows the importance of avoiding falls, especially those related to equipment such as scaffolds and ladders. Overexertion

also contributed to a sizeable segment of the painter injuries.

Since numerous employers and employees were involved, it was not practical for the State investigator to learn as much as would have been desirable—a situation that would be less of a problem under an in-plant situation where the injured and the investigator would both be under the same employer. Thus it will be noticed that column 4 of the table makes little reference to action specifically aimed at correcting personal factors like "absentmindedness", "disregard of instruction" or "poor supervision", which might sometimes have existed. Phrases like "job safety training", and "general safety education" have been used frequently on the assumption that training and stimulation are obviously basic needs as well as means for combating faulty personal factors. Where training is already at a high level and where other choices like "re-assign to other work" are available such other choices could be considered. The Preventive Action column can be more detailed and specific if conditions allow gaining detailed information about the person injured; not only his actions, but more important, the reasons for them.

The Pyramid system should be quite adaptable to various injury groups. It is important that the table be arranged from left to right starting with an accident type which, in effect, is the point of a pyramid—a pyramid on its side. In all cases the figure in parenthesis is the number of accidents in the study involving the adjacent item. It is seen, for example, that 24 of the total 56 injuries came from falls to different levels; that 5 of these 24 falls involved straight ladders and that 4 of these straight ladders, lacking securement, slipped and fell. This is a lot of information to find in one place — enough to awaken even the most obstinate of employers. You will note that the term "unsafe factor" is used as a heading for one of the columns — a heading intended to cover either an unsafe act or an unsafe condition. But it becomes clear in reading farther to the right under the heading "corrective action" whether an unsafe act or unsafe condition was found to be of most importance.

With respect to unsafe acts it was usually necessary, partly because of limited knowledge, to choose broad categories that could cover poor supervision as well as unsafe worker behavior. In cases where a worker made a mistake closely associated with the equipment or operation the term "job safety training" was often entered as the preventive action need. In other instances where his failure appeared more closely related to a lack of safety interest or alertness the term "general safety education" was commonly entered.

In this study only the single most important unsafe factor was recorded in connection with a specific accident. It would have been possible to list both an unsafe act and an unsafe condition for a single accident if, as is often the case, more than one was important and in need of correction. This would then lengthen the fourth column by including two or more preventive actions for each injury — a worthwhile addition that might place additional roadblocks in front of an accident. A dependable physical roadblock, like a V-belt guard, has

(Continued on Page 3)

(Statistics Continued)

long been known to have the advantage of steady dependability, but as shown in column 4 of the tabulation, a strong personal barrier is also important. Personal barriers are not completely dependable, but they are capable

of adding needed reinforcement to a good program of physical hazard control. Such barriers as knowledge, alertness and enthusiasm for safety, are not limited to a particular machine or operation but can work against all accidents regardless of time or place.

PYRAMID EXAMPLE

(56) Painters Injuries

ACCIDENT TYPE	AGENCY	UNSAFE FACTOR	PREVENTIVE ACTION
Fall to Different Level (24)	4. Scaffold—ladder jack.....	{ 3. Not secured..... 1. Over reaching.....	3. Secure ladders against slip 1. General safety education
	4. Scaffold—suspended.....	{ 1. No backrail..... 1. Defective wire rope connection..... 1. Taking unsafe position..... 1. Unknown.....	1. Provide backrail 1. Use 3-wire rope clips 1. Job safety training 1. Pre-employment examination
	2. Scaffold—pole.....	2. Taking unsafe position.....	2. Job safety training
	1. Scaffold rolling.....	1. Floor opening cover unsecured.....	1. Keep area safe for rolling equipment
	4. Ladder—step.....	{ 3. Using equipment unsafely..... 1. Defective ladder.....	3. Job safety training 1. Provision for maintenance
	5. Ladder—straight.....	{ 4. Not secured..... 1. Jumped from ladder.....	4. Secure ladders against slip 1. General safety education
	4. Other.....	{ 2. Inadequate scaffolding..... 1. Opening unguarded..... 1. Inadequate work access.....	2. Provide standard scaffold 1. Job safety training 1. Provide for access
Overexertion (10)	{ 3. Plank.....	3. Lifting in awkward position.....	3. Lifting instructions
	{ 3. Paint can.....	{ 2. Lifting in awkward position..... 1. Unsecured handle.....	2. Lifting instructions 1. Inspection
	2. Ladder.....	{ 1. Unsafe planning..... 1. Lifting too heavy a load	2. Provide aid in lifting
	2. Scaffold.....	{ 1. Lifting too heavy a load..... 1. Lifting in awkward position.....	1. Provide aid in lifting 1. Pre-employment examination Lifting instructions
Struck by (6)	2. Window.....	{ 1. Broken cords..... 1. No warning signs.....	1. Job safety training 1. Provide warning signs
	1. Concrete.....	1. Unsafe planning.....	1. Job planning
	1. Ladder.....	1. Unsecured.....	1. Secure ladder against slips
	1. Metal locker.....	1. Unsecured.....	1. Secure working surfaces
	1. Fan.....	1. Defective switch.....	1. Disconnect electric equipment
Struck Against (4)	1. Saw horse.....	1. Using inadequate scaffold.....	1. Require standard scaffolds
	1. Wall.....	1. Jumping from elevations.....	1. General safety education
	1. Ladder.....	1. Slippery work surface.....	1. Job safety training
	1. Blunt object.....	1. Unsafely arranged.....	1. Job safety training
Caught Between (2)	1. Rolling scaffold.....	1. Unsafe handling.....	1. General safety education
	1. Compressor.....	1. Unguarded.....	1. Guard V-belt
Contact with Hazardous Substance (3)	1. Formaldehyde paint.....	1. Inadequate ventilation.....	1. Provision for ventilation
	2. Paint thinner.....	2. Inadequate ventilation.....	2. Provision for ventilation
Burns (1)	1. Ladder.....	1. Unsecured.....	1. Secure ladders against slip
Other (6)	6. Other.....	1. Failure to use proper equipment.....	1. Job safety training
		1. Unsafely stored.....	1. Instruction
		1. Congested working area.....	1. Improvement of housekeeping
		1. Driving without due control.....	1. Auto driver education
		1. Jumping over objects.....	1. General safety education
		1. Bodily reaction.....	1. Pre-employment examination



Taking the Spark Out of Static

When an employee, spreading an adhesive across polyurethane-foam shapes with a roller, dipped the roller back in the container of adhesive . . . fire!

When a workman filling a drum with xylol had the drum about one-third full . . . an explosion!

When the crew was pumping resin from a tank truck into a storage tank . . . fire!

When a spray-gun operator lowered the tip of the gun into a safety-wash can of flammable solvent . . . fire!

Although some of these fires may have been reported as "probably caused by a static spark," there was little doubt in the protection engineers' mind.

The spark can be so small as to be unseen and unheard and the cause of the fire it starts may be left to conjecture. But static electricity, unless continuously controlled, is a major hazard in areas where there are flammable liquids, vapors, or dusts, or other very easily ignited combustibles.

WHAT IS STATIC?

Static is produced when dissimilar substances in contact are separated. For example, a belt running over a pulley continually generates static as it leaves the pulley. Nonconducting liquids produce static as they flow through a pipe or are agitated in a tank. Gas may do this as it leaves the press rollers. Grain does it as it passes through a pneumatic conveyor system or spills off the end of a belt conveyor. And these are but a few examples.

As static is generated it builds up an electrical charge . . . unless constantly drained off or neutralized. When a sufficient charge has accumulated, a spark jumps to a nearby object of lower potential. That jump or spark is the trouble-maker if it occurs in the presence of highly combustible materials or vapors.

Although you can't prevent static electricity, you can control it. Instead of letting static jump between objects, keep it flowing smoothly from one to the other and to ground without a spark.

Small wires or metal strips provide effective bonding and grounding. A grounding brush or wiper of carbon, brass, or spring bronze is a practical contact between moving and stationary metal parts.

Conductive floors or floor coverings, such as concrete containing metallic powder or conductive-rubber covering, may be needed in some hazardous locations to bond and ground persons and conductive objects. Special connection from a conductive floor to ground is not needed to prevent static accumulation. It is only necessary for personnel and equipment to be in good electrical contact with the floor; with people wearing conductive footwear, and with metal frames or movable equipment making contact with the floor directly or through conductive tips or casters.

Bonding and grounding with artificial humidification is an effective way to lend conductivity to some nonconducting materials. It provides a minute film of mois-

ture over the material and, because moisture is a good conductor, provides a suitable path to ground.

The surface conductivity of most nonconducting materials, such as wood, paper, and cloth depends on the relative humidity; the higher the humidity, the greater the conductivity.

When a large area is humidified, the area and its processes may have uneven degrees of humidity. Local humidification, such as by steam jet, at certain processes may be sufficient to prevent static accumulation.

High humidification can be useful in dry-cleaning operations and in coating, spreading and impregnating operations. But humidification is not always the answer. At some plants the quality or appearance of products is adversely affected by moisture and it may be necessary to maintain low atmospheric humidity. Also, high humidity may present uncomfortable conditions to personnel. In such cases, other methods of neutralization are employed.

HANDLING STATIC WITH IONIZED AIR

When static charges on nonconducting materials cannot be drained off by ordinary grounding or bonding and it is impractical to increase the conductivity by humidification, then it may be necessary to neutralize with ionized air.

Air can be ionized by heat, high voltage, ultraviolet light, or radioactivity. The ionization occurs when electrons are separated from air molecules. These separated electrons are negatively charged, while the molecules which lose them remain positively charged. The charged electrons and molecules are called ions. If a nonconducting charged object is brought in contact with ionized air, the static charge is either conducted to ground through the ionized air or it is attracted to a sufficient number of oppositely charged ions from the air to become neutralized, and a spark will not be produced.

HOW TO DETECT STATIC

Testing for the presence of static electricity in rooms where flammable liquids, gases, or dusts are to be processed or handled, of course, must be very thorough. Even then, it may be some time after a process has been installed, before all the locations where charges accumulate can be found. After provision has been made for static elimination, testing must continue at frequent intervals. Several kinds of instruments are available to help detect static:

The common, inexpensive neon lamp electrical circuit tester is satisfactory. One lead is held in the hand or is grounded, and the other is held at a point where a charge is believed to exist. A charge having a potential of 100 volts or more causes the lamp to flash.

The electroscope . . . the gold-leaf and other more rugged types . . . is more sensitive to the presence of

(Continued on Page 5)

Division Of Industrial Safety Administrative Interpretations

The Division of Industrial Safety enforces the Safety Orders of the State of California. These Safety Orders are minimum safety standards. In adopting or amending any Safety Order the Standards Board lays down as specifically as possible the intent of the Order. In some cases during the enforcement procedure it becomes obvious that some Orders are open to interpretation by enforcement personnel. For purposes of consistency the staff of the Division of Industrial Safety provides a more detailed explanation on a section of a Safety Order.

The following Administrative Interpretations have been developed to further clarify the Safety Orders cited.

Ai-25 REVISED 12/11/74

Subject:

Portable and Moveable Equipment

Reference:

Electrical Safety Order 2361(a)(6)

Background:

The technical staff has been asked for further clarification of the terms "portable" and "movable" as they relate to low voltage Electrical Safety Orders.

The clarification is needed because Electrical Safety Order 2361(a)(6) limits the use of flexible cords for wiring of equipment. The Order allows flexible cords to be used for connection of portable or movable equipment or moving parts of fixed equipment.

Interpretive Decision:

The terms "movable" and "portable" are undefined in the Electrical Safety Orders.

The staff finds the standard dictionary definition of movable applies to the Safety Orders. The definition is: capable of being moved; not fixed or fast; transportable.

The Safety Orders define portable equipment indirectly. They define appliance and portable appliance as follows:

Appliance — Appliance is current-consuming equipment, fixed or portable, such as heating or motor-operating equipment.

Portable Appliance — An appliance capable of being readily moved where established practice or the condition of use make it necessary for it to be detached from its source of current by means of flexible cord and attachment plug.

Since for purposes of implementing Electrical Safety Order 2361(a)(6) the equipment referred to therein is largely confined to appliances, the definition of portable appliance is applicable. Examples of portable and moveable equipment include the following appliances:

- 1) Office Machines (Typewriters, Calculators, Reproduction)
- 2) Hand-held Construction Tools (Circular Saws, Drills)

- 3) Data Processing Equipment
- 4) Cash Registers
- 5) Resistance Heating Devices
- 6) Drinking Fountains
- 7) Bench-Mounted Tools
- 8) Food Preparation Appliances
- 9) Laundry Appliances
- 10) Cleaning Appliances
- 11) Electronic Test Equipment
- 12) Emergency Lighting Equipment
- 13) Food Vending Machines
- 14) Electric Welders
- 15) Coin-Operated Record Players

Ai-43 EFFECTIVE DATE 6/14/74

Subject:

277-Volt Incandescent Lighting

Reference:

Electrical Safety Order 2465(d)

Background:

The Division of Industrial Safety has been approached by engineers who are proposing the installation of incandescent lamps with a medium base screw shell on 277-volt branch circuits. One such installation involved several thousand of these lamps ranging in wattage from 25 to 200 watts.

Interpretive Decision:

Such an installation could present a very dangerous situation if a maintenance man replaced a burned out 277-volt medium base lamp with a regular 120-volt lamp. The 120-volt lamp can be expected to always be readily available on the premises and will fit in the same medium base screw shell lampholder. This condition would be more critical in those installations where the replacement of lamps is not under the strict control of qualified maintenance personnel.

Records of the Division of Industrial Safety contain many instances of persons using 120-volt lamps to test higher voltage circuits, with resulting serious injury to the person when the lamp actually exploded.

We can foresee exactly the same thing happening should these 277-volt medium base lamps be installed in places of employment.

Electrical Safety Order 2465(d) limits the voltage to ground on alternating current branch circuits supplying lampholders to 150 volts. An exception to this Order permits mogul base screw shell lampholders to be installed on circuits having voltages not in excess of 300 volts to ground. A similar restriction appears in Section 210-6(a) of the National Electrical Code.

To provide reasonable safety in places of employment, the Division of Industrial Safety will prohibit the use of medium base screw shell lampholders for use on lighting branch circuits operating at voltages exceeding 150 volts to ground.

Ai-44 EFFECTIVE DATE 6/14/74

Subject:

D. C. Arc Welders—Motor Generator Type

Reference:

Electrical Safety Orders

Background:

Field compliance safety engineers may be unable to calculate motor generator D. C. welder branch circuit conductor ampacity and overcurrent protection size. This is due to non-standard practices in the industry.

Interpretive Decision:

It has been general practice to require that branch circuits for these welders be based on the continuous duty horsepower rating of the motor. This horsepower rating is not given on the nameplate. Therefore, there is a need to provide a common basis of rating to properly apply these welders.

The only rating which is comparable for the various manufacturers is the d.c. output, which is usually 100, 150, 200, 300, 400, or 600 amperes. Using these d.c. output ampere ratings, the welding manufacturers have provided an equivalent continuous duty horsepower rating which is to be used in determining the proper wire size, the necessary horsepower rating of the switch, and the proper overcurrent protection.

It should be pointed out that the Electrical Safety Orders do not require motor running overcurrent protection since welder motors are used for intermittent duty. However, it is customary for the welder manufacturer to provide this motor running overcurrent protection in any starter that he furnishes as an integral part of the welder.

The following table is to be used to determine wire size, horsepower rating of the switch, and overcurrent protection on d.c. motor generator type arc welders:

<i>D. C. Welder Output Amperes</i>	<i>High Reactance Motor Continuous Duty Horsepower Rating</i>
100	5
150	7.5
200 (Junior)	10
200	15
300	20
400	25
600	40

Ai-45 EFFECTIVE DATE 6/14/74

Subject:

Bus Duct Installations

Reference:

Electrical Safety Orders 2357, 2412(g), 2416(a), 2475(b)

Background:

Several problems concerning bus duct installations have recently come to the Division's attention.

Interpretive Decision:

All bus duct installations must meet the following requirements in addition to those appropriate sections of

the Electrical Safety Orders for acceptance by the Division of Industrial Safety:

- 1) Bus duct, where plug-in devices are to be used, shall be installed not more than 18 feet above the floor or ground, except when permanent work platforms or catwalks conforming to 2412(g) and 2475(b) are provided.
- 2) The operating handle shall be so located either on the cover or the side of the enclosure that the fusible plug or circuit breaker unit can be easily and readily operated from the floor. This operation includes opening and closing of the equipment.
- 3) The plug-in switch or circuit breaker shall indicate whether it is in the open or closed position in accordance with 2416(a). This information shall be legible from the floor beneath the bus duct unless serviced from a permanent platform or catwalk.
- 4) Where plug-in devices are installed on bus duct facing downward, only circuit breakers will be accepted.
- 5) Where bus duct is installed under or immediately adjacent to sprinkler heads, suitable provisions shall be taken to prevent water from entering or accumulating in the bus duct, the plug-in devices, or connecting raceways.

Ai-46 EFFECTIVE DATE 7/9/71

Subject:

Car emergency lighting for new passenger elevators.

Reference:

Elevator Safety Orders Section 3034(g)(3).

(3) *Passenger elevator cars shall be provided with emergency lighting in accordance with Article E700, Part 3, Title 24, CAC, and conforming to the following:*

(A) *The emergency system shall provide some general illumination for the car. The intensity of illumination 4 feet above the car floor and approximately 1 foot in front of a car station shall be no less than .2 of a foot-candle. Lights shall be automatically turned on in all elevators in service not more than 10 seconds after normal lighting power fails. The emergency power supply system shall be capable of maintaining the above light intensity for a period of not less than 4 hours.*

(B) *Not less than two lamps of approximately equal wattage shall be provided to obtain the required illumination.*

Background:

Section E700-22 allows unit equipment for emergency illumination where permitted by the enforcing agency and also specifies certain additional requirements or modifications.

The Elevator Unit has the prime responsibility for the enforcement of safety regulations which relate to elevators and will be responsible for the acceptance of emergency lighting systems intended for use with passenger elevators.

Interpretive Decision:

Unit emergency lighting systems will be accepted by the Elevator Unit as meeting the requirements of the Safety Orders subject to the following:

1. It shall be the responsibility of the supplier to provide proper certification to the Division of Industrial Safety that the unit conforms to the California Elevator Safety Orders.
2. The power source shall be a sealed type battery. If other than a rechargeable type battery is used, means shall be provided on the test circuit of the unit to indicate that the voltage output has not dropped below the minimum set by the manufacturer of the unit required to maintain the alarm bell operation for one hour and the light system for four hours.
3. A constant pressure type switch shall be provided and identified for the purpose of checking the system.
4. The unit shall be provided with a durable data plate indicating the manufacturer's name, model number, battery replacement data, etc.
5. Each battery shall be provided with a tag or label indicating replacement date.
6. Manufacturers of emergency lighting units shall provide the purchaser with a brochure and instructions on what is required to keep the unit in operating order.

Ai-47 EFFECTIVE DATE 2/1/71**Subject:**

Elevator Parking Device.

Reference:

Elevator Safety Order 3021(j).

(j) Elevator Parking Device. An elevator parking device shall be provided at one landing, and may be provided at other landings, except on elevators having hoistway doors which are automatically unlocked when the car is within the landing zone.

Parking devices shall conform to the following requirements:

- (1) They shall be mechanically or electrically operated.*
- (2) They shall be so designed and installed that friction or the breaking of any spring used in the device will not permit opening or unlocking a door when the car is outside the landing zone of that floor.*
- (3) Springs, where used, shall be of the restrained compression type which will prevent separation of parts in case the spring breaks.*

Background:

There has been considerable discussion and concern regarding the intent and application of the subject safety order. There has been contention that the order, under certain conditions, is applicable to automatic operation elevators with power operated hoistway doors.

The requirements of this order were lifted from the ANSI A17.1-1965 Safety Code for Elevators, etc. From

the A.S.A. code, A-17-1937 it appears that the requirements for parking an elevator out of service applied only to elevators having car switch or signal operation. Automatic operation elevators were exempted from the requirements.

Interpretive Decision:

It will be the policy of the division that the subject order is applicable only to new installations having car switch operation or signal operation.

Ai-48 EFFECTIVE DATE 6/30/72**Subject:**

Hoistway access switch keys.

Reference:

Elevator Safety Orders Section 3021(k)(2)(C).

(C) The switch shall be of the continuous-pressure, spring return type, and shall be operated by a cylinder type lock having not less than a 5-pin or 5-disc combination with the key removable only when the switch is in off position. The lock shall not be operable by any key which will operate locks or devices used for other purposes in the building. The key shall be available to and used only by elevator inspectors, maintenance men, and repairmen.

Background:

The Elevator Safety Orders do not specifically state that the key used in the car to put the elevator on "access operation" can also be used to operate the access switch so long as the key does not operate any other keyed switch or lock in the elevator or building. Because of this, some elevator companies and some inspectors have interpreted the code to mean that two different keys are required to operate the two keyed switches needed to move the car on access operation.

Interpretive Decision:

It will be the policy of the division that the access lock cannot be operated by a key used for other operations of the elevator such as attendant, M.G. shutdown, emergency service, etc., but the key which operates the access lock may also be used for the key switch in the car which puts the car on "access operation" ready to be operated from the access switch in the corridor.

Ai-49 EFFECTIVE DATE 7/1/74**Subject:**

Guarding of Crane Outrigger "Dolly" Wheels

Reference:

Construction Safety Order 1582.18 (b)

General Industry Safety Order 4937 (b)

(These are identical orders)

Background:

It has been noted that an administrative interpretation is needed regarding the application of these safety orders to the truck-mounted cranes having small wheels attached to the outriggers.

Interpretive Decision:

The intent of these safety orders is to provide a safe place for employees to work when in close proximity of cranes with wheeled outriggers in the working position. It has been pointed out that the crane is constantly moving, an action that in itself creates a constant hazard to the feet of employees who are nearby. The dolly wheels, rolling on the working surface, would more than likely roll over the foot of an unsuspecting workman; therefore, a guard to prevent such an occurrence is required.

Ai-50 EFFECTIVE DATE 9/30/74**Subject:**

Use of double-wrapped No. 12 gage wire as guardrail protection for the ends of work platforms of built-up metal scaffolds.

Reference:

California Administrative Code, Title 8, Construction Safety Order 1644 (f) Metal Scaffolds—Guardrails

Background:

There is a need for uniformity in the application of Construction Safety Order 1644 (f) as it relates to the use of double-wrapped No. 12 gage wire as guardrail protection at the ends of built-up metal scaffold work platforms. Construction Safety Order 1620, Standard Railings, permits the use of materials other than wood for use as guardrail protection provided that they are constructed "in an equally substantial manner." Although No. 12 gage wire (in good condition and properly installed) possesses the requisite strength properties, it does not afford either the necessary visibility or girth to constitute reasonable workman's safety in the event of a fall and, therefore, could not be deemed to be as effective as a standard guardrail as called for in Construction Safety Order 1620.

Interpretive Decision:

The use of double-wrapped No. 12 gage wire shall not be considered as acceptable for use as guardrail protection at the ends of built-up metal scaffold work platforms.

Ai-51 EFFECTIVE DATE 10/24/74**Subject:**

General Industry Safety Order, Cold Storage Room Exits—Specific to fluidized or pneumatic conveyance quick freeze tunnels, particularly, "Frigoscandia-Flo-freeze" and similar units.

Reference:

General Industry Safety Orders 3214(a), 3249 and 3250

Background:

General Industry Safety Order 3249 (defines) "Note: A cold storage space or box is a room used for the preservation of substances by controlled temperature." There

are no time, space or extent of enclosure qualifications. GISO 3250 requires that "cold storage rooms cooled directly by refrigerant coils or by air mechanically circulated over refrigerant coils shall have at least two exits. . . ." "This order shall not apply to cold storage rooms having floor space less than 100 square feet provided that an employee can at no time travel more than 12 feet to an interior operating exit door. GISO 3214 (a) specifies in part, "Every working area specified below shall be provided with at least two escape exits so located with respect to each other as to provide an alternate means of escape to a place of safety. (1) Unless specifically covered elsewhere in these orders . . . , or rooms in or on which are located steam, gas, oil, or air engines . . . or pumps mixing vats, pans, tanks, or chemical processing equipment and where the absence of a second exit would increase the risk of injury from hot, poisonous, corrosive, suffocating, flammable, or explosive substances."

Ammonia NH_3 which is stated to be the refrigerant used in the subject units is corrosive and asphyxiant (suffocating), therefore, classifying the subject units under the requirement of 3214 (a)(1).

Interpretive Decision:

The "Frigoscandia-Flofreeze" units as described fit the definition noted under 3249 (d) and also one of the conditions stated in 3214 (a)(1) and, therefore, require two exits under both GISO 3214 (a)(1) and GISO 3250.

Ai-52 EFFECTIVE DATE 11/27/74**Subject:**

Computing Building Occupant Loads to Determine Number of Exit Units Required

Reference:

General Industry Safety Order 3214, Table 33A (Table E-1 in current revision proposal)

Background:

Table 33A which follows General Industry Safety Order 3214 is referenced in 3212 (d) and 3214 (a), was extracted from the Uniform Building Code and CAC, Title 24, to provide a method of computing occupant load for the purpose of determining the number of exits required for buildings of various usage. There was no intent either in the Uniform Building Code or Title 8 to use the table to compute work space requirements. This intent is rather clearly shown in Exception 2 under 3212 (d) which states: "The occupant load permitted in a building or portion thereof may be increased above that specified in this Section if the necessary exits are provided. An approved aisle or seating diagram may be required by the Building Official to substantiate an increase in occupant load," and the sentence which follows Exception 2 and the exception which follows that sentence, "In determining the occupant load, all portions of a building shall be presumed to be occupied at the same time. Ex-

ception: Accessory use areas which ordinarily are used only by persons who occupy the main areas of an occupancy shall be provided with exits as though they were completely occupied, but their occupant load need not be included in computing the total number of occupants for the building."

This Table (33A) is reproduced and recaptioned E-1 in the current General Industry Safety Order revision proposal to be presented to the Standards Board, and will be clearly labeled to show the singular purpose of computing exit unit requirements. Use of the table for computing work space requirements is contrary to intent. This is evidenced by 3212 (d) and particularly the blanket exception (d) 2 and the concluding sentence of 3212 (d) with Exception. Further substantiation of intent is found in 3214 (the other reference to Table 33A) which deals exclusively with exits.

Interpretive Decision:

The intended purpose of Table 33A in the General Industry Safety Orders is to provide a method of computing exit units required in various occupancies, based upon floor area. Table 33A is not intended to prescribe individual work space.

Ai-53 EFFECTIVE DATE 11/26/74

Subject:

Cleaning Insulators on High Voltage Transmission Lines

Reference:

High Voltage Electrical Safety Order 2942(b)

Background:

Suspension strings of insulators on high voltage transmission lines are being climbed on by linemen during the procedure of wiping or cleaning contaminated insulator surfaces. After climbing down the insulator string, the lineman often either stands or sits on the conductor at the lower end of the insulator strings, while cleaning the insulators. This procedure is used in lieu of aerial lift equipment, portable platforms or ladders. On some lines, there is a corona ring or shield at the top and bottom of the suspension string which makes it difficult for the lineman to get onto the insulator string.

On dead end insulator strings, the insulators are in line with the conductor, and often there are two parallel strings. A rope loop is tossed over the far end of this string, and the lineman sits on this rope and makes his way out to the end so he can clean the insulators.

Interpretive Decision:

High Voltage Electrical Safety Order 2942(b) provides that the employer shall furnish suitable aerial lift equipment, portable platforms, or *other devices* to permit employees to work on insulators attached to poles, towers or structures when such insulators are not otherwise safely accessible. The phrase, *other devices*, would permit the use of a ladder to gain access to the insulators. Climbing on the insulators does not provide the safe access required by this Order.

Ai-54 EFFECTIVE DATE: 12/12/74

Subject:

Responsibility for Furnishing and Paying for Safety Devices

Reference:

Labor Code Sections 6306(b)

6308

6401

6403(a)

Policy and Procedure Directive No. 54
(Personal Protective Equipment)

Background:

The Division of Industrial Safety has received many inquiries concerning (1) what is meant by the term safety device and (2) who is responsible for furnishing and paying for them. The Labor Code provides that the term safety device "shall be given a broad interpretation so as to include any practicable method of mitigating or preventing a specific danger." Various safety orders have defined what types of safety devices are required for certain work environments. In addition, the Division is empowered to declare and prescribe what safety devices are necessary to render a place of employment safe. Such power is discretionary and would be exercised with respect to specific factual circumstances based upon the technical determination of the Division's engineers. The Labor Code has long required that employers furnish, provide, and require the use of safety devices. Recent court decisions have clarified the financial responsibility associated with such requirements.

Interpretive Decision:

The employer has the responsibility of furnishing and requiring the use of devices. In addition, the employer is also required to pay for such safety devices. The term safety device shall be given a broad interpretation and may be defined, if necessary, for specific work environments by courts of law, the Standard's Board, and the Division of Industrial Safety. Although the Division of Industrial Safety is empowered to declare and prescribe necessary safety devices, it is not required to do so. Such power is discretionary and its exercise would depend upon the facts and technical considerations incumbent in a given situation.

Ai-55 EFFECTIVE DATE: 12/18/74

Subject:

Temporary floors for buildings under construction or repair.

Reference:

California Administrative Code, Title 8, Construction Safety Order 1635, Temporary Floors—Labor Code Excerpts

Background:

There is a need for uniformity in the application of Construction Safety Order 1635 as it relates to the issuance of citations for violations of specific Labor Code sections embodied within this safety order.

The Division of Industrial Safety was charged by the California Legislature with the responsibility for the enforcement of Articles 1 and 4 of Division 5, Part 3, Chapter 1 of the Labor Code. For this reason, the Division adopted CSO 1635 and placed the contents of these two Articles of the Labor Code under the heading of Article 20—Temporary Floors—of the Construction Safety Orders.

Interpretive Decision:

When issuing citations for the violation of specific Labor Code provisions contained within CSO 1635, list, in column 8 on Cal/OSHA Form 2-A, the specific Labor Code section involved *in addition to* the “8 CAC 1635” designation. In this way, the employer receiving the citation is fully apprised of the *specific* condition that prompted the issuance of the citation.

Ai-56 EFFECTIVE DATE 1/10/75**Subject:**

Cranes—Load Rating Reduction
General Industry Safety Order 5027

Reference:

General Industry Safety Order 5027 (Register 72, No. 50). Safe Working Load Reduction. If the operation in which equipment is engaged never utilizes more than a fraction of the safe working load rating, the owner of such equipment may, at his option, have the crane or derrick certificated for and operated at a lesser maximum safe working load in keeping with the use and based on radius and other pertinent factors. Provided, however, that the equipment concerned is physically capable of operation at the original load rating and the load reduction is not for the purpose of avoiding correction of any deficiency.”

(Proposed Revision) General Industry Safety Order 5027 reads: “Safe Working Load Reduction. If the operation in which equipment is engaged never utilizes more than a fraction of the safe working load rating, the owner of such equipment may, at his option, have the crane or derrick certificated for and operated at a lesser maximum safe working load in keeping with the use and based on radius and other pertinent factors, provided, however, that the equipment concerned is physically capable of operation at the load rating and the load reduction is not for the purpose of avoiding correction of any deficiency. Load rating charts shall be changed accordingly.”

Background:

At the time the Crane Safety Orders were revised in response to SCR 44, safety order 5027 was adopted by the Industrial Safety Board. The purpose of that order was to allow crane users to have the safe load rating of a crane reduced where their use never utilized more than a fraction of the stated capacity of the crane. The word

“original” load rating was written into that order to reinforce the concept that the load rating reduction could not be made for the purpose of concealing a structural defect or to avoid correction of such defect. However, it is found that such use of the word “original”, qualifying “load rating”, actually prohibited such reduction of load rating. This is particularly true in relation to hydraulic powered cranes where the load lifting capabilities are reduced, in downrating, by lowering the by-pass opening pressure. That order (5027) as written also failed to prescribe a change of load rating charts to conform to the new “maximum load” rating. The Division has proposed to the Occupational Safety and Health Standards Board, a revision of 5027 which deletes the word “original” which qualified “load rating” and adds the words “load rating charts shall be changed accordingly.”

Interpretive Decision:

It is the purpose of GISO 5027 to allow a crane owner or user to have the load rating of a crane certified to a lower capacity, and use the crane within that lowered capacity range, by a person qualified to examine and certify cranes as provided in GISO 5021, if the crane is capable of operating at the new established load rating and the downrating is not for the purpose of concealing a structural deficiency or to avoid correction of such deficiency, and if the old load rating charts are replaced by new charts computed in relation to the new lower rating.

Ai-57 EFFECTIVE DATE 1/16/75**Subject:**

Erection and Dismantling of Scaffolds

Reference:

California Administrative Code
Title 8
Construction Safety Orders
Article 21
Scaffolds—General Requirements

Background:

The Division is aware of the fact that during the erection and dismantling of scaffolds it is not possible to be in compliance with all applicable standards for the finished scaffold.

Interpretive Decision:

Therefore, it will be necessary for the safety engineer to exercise good safety engineering judgment when he surveys this type of activity and he must be satisfied that suitable procedures or devices are used to provide freedom from hazards to workmen while they are erecting and dismantling the scaffold.

Additional Administrative Interpretations will be published in the California Safety News as they are issued. In order to keep these Interpretations together for easy filing, they will be published in the center pages of the magazine with the pages indicated by Roman numerals.

(Statistics Continued)

electrostatic charges than the neon lamp. Neither however, gives much quantitative data.

Electrostatic voltmeters are available which provide quantitative measurements. Portable vacuum tube static meters . . . several makes are listed in the FM Approved Equipment Guide . . . indicate whether a potential, or electrical difference, is present between objects. One type indicates whether or not adequate grounding is being provided.

Another electrostatic voltmeter indicates the presence of electrostatic charges and gives an audible and visual alarm when conditions are hazardous. Still another, usually custom-built, called a generating voltmeter "field mill," consists of a variable condenser which, when exposed to an electric field, transforms the electrostatic charge into a continuously varying charge or alternating current. The current is then amplified and rectified to operate a d-c meter which measures the strength of the field.

Whatever the instrument used, tests for static charges in dangerous locations should be made with great care. The operator and the instrument should both be grounded frequently in an area where a spark will do no harm. When electrically operated detectors are used in hazardous areas, care must be taken to avoid ignition by the instrument itself.

HANDLING STATIC WITH BONDING AND GROUNDING

Bonding and grounding of all metal parts of static-producing machines are a must in hazardous locations. Bonding keeps the parts at the same potential so that no spark discharge can occur. Grounding the conducting object drains the static charges away as rapidly as produced. With the difference in potential between objects and between the objects and the ground eliminated, the threat of sparks is also eliminated.

Rows of small gas flames, for example, are sometimes used on printing presses to ionize the air and eliminate static electricity from the paper as it is discharged from the press. The gas supply is interlocked electrically with the press so that the flames are extinguished automatically when the press is stopped. Of course, this method should not be used on presses using volatile, flammable ink.

Nonelectrically-energized static collectors or neutralizers can be used to ionize air. When an object charged with static is brought near a sharply pointed, grounded

metal object, the electrostatic field produced by the charge induces a voltage at the point. When the voltage is above a certain minimum value, spontaneous ionization of the air occurs. Ionization reduces the static to below the danger point by draining off or neutralizing the charge.

One type of nonelectrically-energized static neutralizer employs a metal bar with numerous grounded brass, bronze, or copper wires having sharp point. Another type is made of metallic tinsel surrounding a metal wire or wound on a wood rod and grounded.

Electrically-energized neutralizers produce an alternating field of positive and negative ions between electrified points and a grounded member, which may be a part of the neutralizer. The neutralizer is located where the static charges accumulate, the air is ionized by the high voltage, and the charges are neutralized.

Several makes of neutralizers employ this principle. They consist of rows of pointed electrical conductors connected to the high voltage secondary of a small step-up transformer. Although the potential is 5,000 to 15,000 volts, conductors are well-insulated, the points well-guarded, the current capacity limited, and the shock hazard to workers slight. To eliminate static electricity completely from processing machines handling sheets or webs of paper, fabric, or other non-conducting material, rows of electrified points are installed near all places where static is generated.

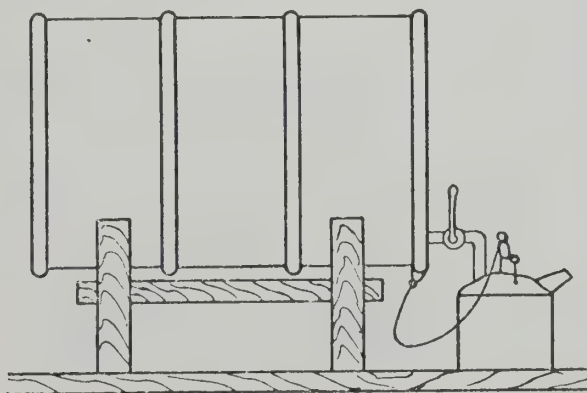
Electrically-energized equipment is not recommended for general use where there are flammable liquids or gases in hazardous quantities, because the devices may introduce some ignition possibility. However, such devices are sometimes permitted under special supervision where other methods of static control are inadequate, as they may prevent more fires than they are likely to cause.

Static neutralizing, air cleaning assemblies consisting of an ionizing air gun or ionizing air nozzle, reduces the hazards or the nuisance of static charges by directing an ionized airstream onto the material being aircleaned. The assemblies are intended for such uses as cleaning surfaces to which dirt and dust are electrostatically attracted, for separating sheets of plastic, paper, and similar materials, and for dusting objects before painting them.

Radioactive static neutralizers are also available. Either radium or polonium is employed to emit alpha particles which ionize the air between the neutralizers and the charged object. No external power is required and neutralizers are safe to use from a fire-prevention standpoint in hazardous locations. However, they usually require acceptance by public health authorities because of possible health hazard to operators.

The generation of static is, of course, very general and unavoidable, but it is not necessarily a hazard. Conditions in a particular area may be such that static does not build up dangerous accumulation before discharge or there are no materials present that are susceptible to ignition by its sparks. However, contemplated changes in processes, if they introduce either increased static potentials or susceptible materials, warrant a thorough investigation to determine the need for static control.

(Continued on Page 6)



(Statistics Continued)

LET STATIC FLOW

Static electricity can be a hazard at equipment where it is produced abundantly or at processes where materials are susceptible to ignition by its sparks. Examples may be power belts, especially the flat ones made of rubber for carrying heated or dry materials. Other examples are processes in which paper and other nonconducting materials are coated or impregnated with paints, lacquers, varnishes, or rubber compounds.

Static electricity is generated in nonconducting liquids as they move in contact with other materials. For instance, charges develop when the liquids are discharged from a hose, when they are transferred from container to container, or when they are mixed or pumped. Movement of granular or powdered materials, and sometimes gases, also may create a static problem.

AT POWER BELTS . . . THREE METHODS OF CORRECTION

The most satisfactory way to correct static conditions at power belts is to replace nonconductive belts with belts made of conductive materials . . . usually rubber containing particles of carbon, and available from most belt manufacturers. Static conditions can also be corrected by grounded static collectors placed in near-contact with the belt, four to six inches beyond the point where the belt leaves the pulley. Or the belts can be treated with a special dressing that lends conductivity to the belts, but the treatment must be repeated at frequent intervals.

FLAMMABLE LIQUIDS . . . STATIC A DOUBLE HAZARD

The static hazard exists, potentially, when an unheated flammable liquid has a flash point of 200° F. or less. And it exists when a flammable liquid of a higher flash point is heated to within 50° F. of its flash point. Not only can vapors of such liquids be ignited by the sparks of static electricity, but flammable liquids generate static when they are in motion and in contact with other materials—their containers, for instance. Unless corrective measures are taken, static charges accumulate on their surfaces until an arc occurs. Only a small spark is needed to ignite a flammable vapor-air mixture.

The following practices are the general safeguards of flammable liquids against static:

Bond and ground the equipment used in storing and handling flammable liquids of low flash point and high electrical resistance. When flammable liquids are being transferred from one container to another, the metal containers or drums and the conductive fill nozzle or fill pipe must be in contact with . . . or bonded to . . . the edge of the fill opening to avoid a static discharge at the opening. Nonconducting containers do not need to be specially bonded or grounded.

Minimize agitation of the liquids. Run tank fill pipes to near the bottom of the tank to help reduce agitation of liquids and generation of static. The filling pipe sometimes can be arranged to reduce turbulence by directing

the liquid horizontally. Operators are cautioned to avoid splash filling.

Bond the parts of a distribution system. Distribution pipelines can be electrically bonded to each other and to metallic containers or tanks. Bonds should connect around nonmetallic or insulated pipes and joints. Special bonding is not needed at closed continuous metallic systems.

Slow down the flow of liquids. The slower flammable liquids flow through their piping, the slower the generation of static. That is why many fill pipes are given an enlarged section somewhere along their lengths; it helps reduce the velocity.

COATING AND SPREADING . . . RUBBER CEMENT . . . MULTIPLE STATIC PROBLEMS

Coating and spreading operations employing flammable solvents present a complex protection problem. Finding all the points at which static electricity is generated requires thorough testing of all areas with an electrostatic voltmeter. Static electricity is produced when the material being treated is unwound from rolls, when it passes over rollers or when it is rolled up. The faster the equipment is operating and the higher the temperature of the material, the faster the generation of static. Static collectors are installed at all these points, and all metal parts are bonded, that is the rollers, the containers for the coating materials, the spreader knives, the doctor blades, and the machine frame, which is grounded. To correct general static conditions in the area not entirely corrected by these safeguards, the humidity in the area is raised to 50 per cent or above—the higher the better.

But use of humidity depends largely on whether or not the higher moisture content of the atmosphere is harmful to the product. Protection planning must also take into account that with every change in humidity there is a change in conductivity. Humidity may be dangerously low near parts of a process operated at higher temperatures, and static drain-off can stop at these points even though the general area is amply humidified.

At machines applying rubber cement, a relative humidity of about 75 per cent in the coating enclosure and at least 50 per cent in the drier is recommended. The cement may contain as much as 95 per cent naphtha. At machines running at high speed, it is seldom practical to eliminate all static with either humidity or collectors, and both must be applied. Static is generated as the fabric is passed through a cement bath, through a drier, and as it is rolled up, usually with a liner.

Locations where rubber cement is applied by hand also need the attention of static control. In the first place, all cement containers should have the fire-safety of self-closing covers. The tops of cementing tables can be covered with grounded sheet metal and the floor under the tables covered with grounded plates or with conductive floor covering. These conducting table and floor surfaces, of course, must be kept free of insulating deposits, to keep them conductive. The relative humidity should be maintained at 50 per cent or more. And it is absolutely essential that personnel be aware of the techniques in static-spark prevention at such operations.

(Static, Continued)

AND PEOPLE . . . EVERY TENTH STATIC FIRE IS CAUSED BY "BODY STATIC"

We all generate static electricity. People with unusually dry skin are more likely to accumulate static charges than people with more moisture over which static can drain off. Working near machinery can sometimes accelerate generation of static. Even walking, or moving about can generate it. In areas where the humidity is low, a worker can accumulate static to a potential of several thousand volts.

In a flammable-vapor or dust-area, people can be about as hazardous as spark plugs unless successful efforts are made to drain off static as rapidly as it is developed.

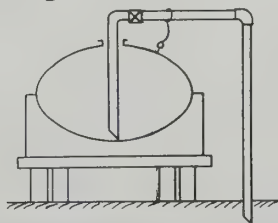
Obviously, people with dry skin should not be employed in high hazard areas. For others, safeguards can be provided. Operating rules can prohibit rubberbottom footwear, and in some locations they might require special conductive shoes. In very hazardous areas, for example, where ethers are used, rules may prohibit certain types of clothing, silk, and wool, for instance, and synthetics except rayon. In areas where static conditions could be a problem, floors are usually made conductive, and where conditions are not severe, raising the relative humidity as high as practical will help.

HOW TO UNLOAD OR LOAD TANK TRUCKS AND RAILROAD TANK CARS WITH STATIC SAFETY

When these tanks are unloaded or loaded through an open dome, it is essential that the fill pipe or discharge pipe extends to near the tank bottom. This lessens agitation of the liquid and generation of static. And a bonding conductor must be connected between the filling or discharge pipe and the tank to prevent a spark between the pipe and the opening rim. It is important that this conductor is always attached before the filling pipe is allowed to make any contact with the tank and that it is not disconnected before the contact is broken.

If unloading or loading is through closed piping and connections, whether conducting or nonconducting, these special precautions are not needed. Vapors are not likely to be released at the points where sparks can occur. And when a tank truck is unloaded through a bottom connection into an underground tank, it is only necessary that the hose be in contact with the fill pipe of the tank.

It should be pointed out that tank trucks accumulate static generated by the flow of liquids during filling and by the rotation of tires while the truck is in motion, and that drag chains are not sufficiently effective. The precautions outlined must be used to control static during loading and unloading.



Bonding while filling a tank truck

(Chiefly Speaking, Continued)

Department of Health has been involved with the comparison of health standards.

By October 31, 1975 State safety and health standards must be submitted to the United States Secretary of Labor so that they may determine if the State's safety and health standards are as effective as those of the federal government. Approximately 75% of the General Industry Safety Orders in question have already been presented to the Occupational Safety and Health Standards Board by the Division or Department of Health. More than 2/3 of the Construction Safety Orders have been presented.

The process of modifying and creating standards is necessarily long. The Regional Office of the Department of Labor made the initial assessment of the existing State orders. Their comments were given to the appropriate State department, Health or Safety, for action.

Safety standards which the Regional Department of Labor felt were not as effective as the federal government's were given to either the elevator, construction, industrial, pressure vessel, electrical, or mining unit—depending on the subject of the standard.

The units modify the existing standard, create a new standard or write a justification of why the State standard is as effective as the federal. The revised standard is returned to the Regional Department of Labor for its opinion of the standard's effectiveness. The Department of Labor returns the standard to the unit with its approval or for further work.

If substantive changes are made, it is returned to the Regional Department of Labor by the Division once more. If not, it goes to an Advisory Committee.

The Advisory Committee consists of four representatives from management, four from labor, one from a public utility, one from the public at large, two from standard setting boards, and one California building official. The Advisory Committee discusses the standard and returns it to the Division with its approval or recommended changes. If the Division makes substantive changes, the standard is re-submitted to the Regional Department of Labor. If not, it is sent to the California Occupational Safety and Health Standards Board for public hearing.

Anyone may offer an opinion or recommendation concerning the standard at this meeting. The standard is returned to the Division for any changes. If the changes are great, it is sent to the Regional Department of Labor once more for review. If not, it returns to the Standards Board and at a public meeting it is approved, modified again, disapproved, or returned to the Division. Eventually, the Standards Board adopts a version of the standard. The Standards Board files the standard with California's Secretary of State and 30 days later it becomes effective.

Copies of the standard are then sent to the Depart-

(Continued on Page 9)

APPEAL DECISIONS ON EMPLOYEE EXPOSURE

STOLTE, INCORPORATED—Docket No. 323

Employer, a general contractor, had rented a fully equipped and operated crane. He was cited for three non-serious violations and assessed \$85 penalty.

At the hearing it was established that appellant's employees were not exposed to the unsafe condition. Only the crane operators were exposed. The crane operators were ruled to be independent contractors or employees of the independent contractor.

The citation was set-aside and the penalty vacated, *because*: None of the appellant's employees were exposed to the unsafe condition. The exposed employees were the sub-contractor's employees. The Board said, "... the OSHA Act was enacted for the specific benefit of employees, but the Act does not generally require one employer to be responsible for the safety of employees of another employer."

1-DONOHUE ASSOCIATED—Docket No. 233

Employer was cited for unsafe scaffolds and assessed \$45 penalty.

At the hearing it was found that appellant did not challenge the allegations, but argued that the scaffolds belonged to the general contractor.

The Board affirmed the citation and the penalty, *because*: Even though the scaffold belonged to the general contractor, the division's evidence showed that the sub-contractor's employees would have occasion to use the scaffold in the course of their work and were exposed to the unsafe condition.

PACESETTER CONSTRUCTION—Docket No. 497

Employer, a sub-contractor, was cited for failure to provide guardrails.

At the hearing appellant contested that the guardrails were removed by another sub-contractor.

The citation was affirmed, *because*: The appellant permitted his employees to work at a site which presented an unsafe condition. It is unfortunate that other individuals had removed the guardrails, but it was appellant's duty to reinstall them.

OLTMANS CONSTRUCTION—Docket No. 240

Employer was cited for violation of 8 CAC 3213—failure to provide guardrails on the perimeter of the roof and assessed \$130 penalty.

At the hearing evidence presented showed that the employee observed on the roof was not one of appellant's employees, but rather an employee of another sub-contractor.

The citation was set-aside and penalty vacated, *because*: Absence of showing of any exposure of employer's employees, the appeal must be granted.

GARCIA-VALENZUELLA PLASTERING—Docket No. 286

Employer was cited in violation of 8 CAC 1764—lack of 6 foot clearance between the metal scaffold and the overhead hot wire.

At the hearing evidence indicated that at the time of inspection no employees were observed on the metal scaffold, but the evidence did show that the scaffold had been used.

The citation was affirmed, *because*: Even though at the time of inspection no employees were observed on the scaffold, evidence (i.e. circumstantial evidence) indicated that employees had used the metal scaffold at some prior time, i.e. employees had been exposed to the unsafe condition.

JACK SLOMOVIC ELECTRIC—Docket Nos. 242 & 249

Employer was cited in violation of 8 CAC 1633—unguarded elevator shafts.

It was established at the hearing that all elevator shafts were unguarded. It was also found that appellant's employees were confined to a limited area in that building, not near the elevator shafts.

The citation was set-aside, *because*: Appellant's employees were not exposed to the hazard, even though the hazard existed.

(Continued on Page 10)

CALIFORNIA SAFETY NEWS

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REPORTING WORK-CONNECTED INJURIES

Reporting Work-Connected Fatalities and Serious Injuries:

(a) Every employer shall report immediately by telephone or telegraph to a District Office of the Division of Industrial Safety any industrial accident or occupational illness of an employee of that employer arising out of or occurring in the course of his employment which results in death or causes serious injury or illness.

Immediately means as soon as practically possible but not longer than 24 hours from employer's receipt of knowledge of the death or serious injury or illness.

Serious injury or illness means, as defined in Section 330(o) of this Chapter.

(b) Whenever a state, county, or local fire or police agency is called to an accident involving an employee covered by this part in which a serious injury, or illness, or death occurs, the nearest office of the Division of Industrial Safety shall be notified by telephone immediately by the responding agency.

(c) When making such report, whether by telephone or telegraph, the reporting party shall include the following information, if available:

1. Time and date of accident.
2. Employer's name, address and telephone number.
3. Name and job title, or badge number of person reporting the accident.
4. Address of site of accident or event.
5. Name of person to contact at site of accident.
6. Name and address of injured employee(s).
7. Nature of injury.
8. Location where injured employee(s) was (were) moved to.
9. List and identity of other law enforcement agencies present at the site of accident.

(d) Serious injury or illness or death caused by the commission of a Penal Code violation, except Penal Code Section 385 relating to operating equipment near high voltage conductors, need not be reported to the Division of Industrial Safety. Accidents occurring on a public street or highway need not be reported.

(e) The reporting in (a) and (b) above, is in addition to any other reports required by law and may be made by any person authorized by the employers, state, county, or local agencies to make such reports.

FILM FOCUS . . . On Electrical Safety

The film, "RIP Harry Sparks" gives an account of how Harry Sparks learned the value of electrical safety the hard way—via electrocution—then, as an angel, saved others from a similar fate. It is a fast paced attention grabber, loaded with good advice on the power and proper use of electricity.

The physiological effects of electricity on the body during an electrical shock are presented in easily understood terms. In his travels, Harry warns careless workers about many of the most common mistakes made when using electricity.

The film is available from the Division upon written

(Chiefly Speaking, Continued)

ment of Labor. When the total package of standards are completed, the Department of Labor will judge them for their effectiveness when compared to federal standards.

The process of changing and creating safety and health standards requires tremendous cooperation between various branches of the State and the federal government. This spirit of cooperation has aided California in its goals of complying with federal standards and making California a safe and healthy place to work.

Construction Permit Requirements

For three types of hazardous work, all private employers, except public utilities, are required to obtain a permit from the Division before operations begin (65). These are:

- (a) Construction of trenches or excavations which are 5 feet or deeper and into which a person is required to descend.
- (b) The construction of any building, structure, falsework, or scaffolding more than 3 stories high.
- (c) The demolition of any building, structure, falsework, or scaffolding more than 3 stories high.

A copy of the permit must be posted for the information of employees (6504).

The Division may require a safety conference prior to the start of actual work (6502). This conference must include representatives of the owner or contracting agency, the contractor, the employer, employees and employee representatives. The employer's safety program and the means and practices he intends to use in providing a safe place of employment must be discussed in the conference (6503).

The Division may revoke this permit for good cause at any time (6505).

request without charge. Send requests, including the date or dates the film is needed, to:

Division of Industrial Safety Staff Services, Rm. 7216
455 Golden Gate Avenue, San Francisco, California 94102

FREE CAL/OSHA PUBLIC WORKSHOPS

The workshops are conducted by the Consultation staff of the Division of Industrial Safety.

They run about four hours, with ample time allowed for questions and answers.

The forthcoming ones are scheduled:

—April 23, 9:30 a.m. to 12:30 p.m.—In Sacramento, SMUD Auditorium, 6201 "S" Street. Topic: *Construction Safety Orders*.

—April 23, 8:30 a.m. to 12:30 p.m.—In San Bernardino Convention Center, Hall B, 303 North E Street. Topic: *General Industry, Construction and Electrical Safety Orders*.

—May 12, 8:30 a.m. to 12 noon—In San Francisco, State Building, Room 1194, 455 Golden Gate Ave. Topic: *Employee-Employer Rights Under CAL/OSHA*.

—May 15, 9:00 a.m. to 1:00 p.m.—In Walnut, Mt. San Antonio Jr. College, Social Science Hall Auditorium, Grand and Temple Ave. Topic: *Employee-Employer Rights Under CAL/OSHA; General Industry Safety Orders*.

CRANE OPERATING PROCEDURES

The following procedures should be considered (to supplement prescribed standards) for operation of cranes near power transmission and/or distribution lines:

1. The supervisor of a crane operation is to contact the appropriate power transmission and/or distribution center and state the nature of the operations being conducted.
2. The power transmission and/or distribution center is to tag circuit controls for that appropriate distribution center.
3. The tag should contain information concerning the location and type of operations being conducted near transmission lines.
4. If possible, automatic cycling on power transmission and/or distribution center controls for the appropriate transmission line should be placed on manual operation.
5. If center controls "kick out" during crane operation period, a check should be made at the crane operation site before returning controls to normal operation.
6. At the completion of crane operations, an "all clear" should be given to the power transmission and/or distribution center by the supervisor of crane operations.

(Appeal Decisions, Continued)

BERGELECTRIC CORPORATION—Docket No. 379

Employer was cited in violation of 8 CAC 1513 & 1632—failure to keep work areas reasonably clear, and to provide adequate guarding for floor openings on the 1st, 2nd and 3rd floors of the building.

At the hearing it was found that appellant's employees were observed working on 1st, 2nd or 3rd floors, i.e., his employees were not exposed to the unsafe condition. And that access from the basement to the 5th floor was effected by use of the ladders and not through the poor housekeeping area.

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5274
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Eureka	619 Second St. 95501	707-442-5748
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VOL. 59, NO. 1

JANUARY 1975

Proof Testing Cranes Proves Itself

Benefits arising from the CAL/OSHA requirements for the proof testing and examination of cranes recently paid off in a rather dramatic way. The proof test described in Article 99 of the General Industry Safety Orders requires that the boom and hoist mechanisms on the unit be subject to a 10% overload. It was during such a test on a crane owned by a California utility that a failure occurred on a critical component of a nearly new 45 ton mobile crane.

At the time of the failure, test weights totalling 99,000 lbs. were suspended about 8 inches above ground and held by the set clutch band on the hoist drum. After approximately one minute the suspended load suddenly dropped to the ground.

Subsequent investigation revealed that a butt weld had failed where an end clevis was mated to the clutch band. Examination at the break indicated only $\frac{1}{16}$ inch of weld penetration on one side of the joint. On the opposite side the weld metal was deposited on the parent metal adjacent to the joint with no penetration at the critical area. Other bands from this crane and another similar machine were removed and subjected to thorough examination, including X-ray. All were rejected because of lack of fusion and scattered porosity at the butt weld. Several components had minute longitudinal cracks as well.

The crane manufacturer cooperated fully in resolving the problem encountered with the unit concerned here,

and made every effort to insure that substandard welds did not exist on similar components of other cranes sold by the firm.

The engineer supervising the proof test on the crane stated that as far as he was concerned this one test had pointed out the value of the required testing program. Although the engineer had some earlier reservations about the necessity of proof testing each unit, he recognized that a failure under controlled test conditions was much better than a similar failure under operating conditions with a greater risk of injuries, death or property damage.



Clutch band clevis showing break and lack of penetration of weld material.



Clutch band showing point of clevis attachment.



CHIEFLY SPEAKING

Richard Wilkins

In 1974 the California Occupational Safety and Health Plan swung into intensive action. Implementation of the plan was the prime objective of everyone in the Division.

During the year, the Division added 69 safety engineers to the staff. Of these, one position was added to the Pressure Vessel Unit and two to the Education Unit. All other safety engineering positions were added to the Compliance Staff. At the end of 1974, the Division had 170 Compliance Safety Engineers, 22 District Managers,

Continued on Page 2

Chiefly Speaking, Continued

6 Regional Managers, and 18 Safety Engineering Consultants.

Statistics for compliance activity are available for the first three quarters only. They testify to the tremendous activity of the Division. Between January and September there were 11,136 inspections made by Compliance Safety Engineers. Of these inspections, approximately 59 percent were regularly scheduled investigations. Nearly 9 percent were follow-up inspections conducted to determine if employers had corrected violations previously cited. Slightly more than 26 percent were due to complaints. About 6 percent of the inspections were initiated by catastrophies or fatalities at the work places. These inspections affected over 700,000 California employees.

Approximately 22 percent of all work places inspected during this period were found to be in compliance with the safety and health standards of the State. However, in establishments not in compliance, over 46,000 violations were found. Of these, only 743 were serious violations. The vast majority, 45,784, were classified as nonserious. The average number of violations found in establishments not in compliance was slightly over five.

The Department of Health has done much to assist the Division with inspections. Between January and September of 1974, the Department's Industrial Hygienists aided the Division in 406 inspections. They spent 17,506 total man-hours on the investigation.

The Division has been active in areas other than safety compliance inspections. It has endeavored to educate employers and employees about job safety and the CAL/OSH Plan. Sixteen seminars explaining the basic CAL/OSH Plan were conducted at various locations throughout the State in 1974. Over 13,000 people were in attendance.

In 1974 the Division held workshops in Vernon, Fresno, San Diego, Stockton, Lancaster, San Francisco, Inglewood, and Visalia. These workshops, unlike the seminars, explored specific safety problems. Violations of the safety and health standards which the Division felt would most likely be a problem in a particular region were explored in the workshops (i.e., the Stockton workshop dealt with agricultural safety; the San Francisco workshop with industrial safety). These workshops had an attendance of over 500 people.

1974 was a busy and fruitful year for the Division. The challenges set before the Division by CAL/OSH Plan and Assembly Bill 150 were grappled with in no uncertain terms. The success of the CAL/OSH Plan rides largely on the performance of the Division in administering it. The past year demonstrated that the Division is capable and willing to meet its responsibilities.

1. Define "qualified electricians or persons" as used in electrical Safety Order 2949.

Answer: A qualified person is defined as a person who, by reason of experience or instruction, is familiar with the operation to be performed and the hazards involved.

2. Does High-Voltage Electrical Safety Order 2946 relating to clearances from overhead high-voltage lines apply to electrical workers in general who may be erecting street lighting or traffic lighting poles?

Answer: Yes. The order applies to all workers in general excepting only those who can be defined as qualified persons. Inside wiremen are not necessarily qualified unless they have had the required experience or instruction.

3. Who in the Division has prime responsibility for the classifying of hazardous areas such as liquor processing, grain milling, cotton ginning, etc., and how does one avail himself of these services if he needs them?

Answer: Evaluations of hazardous areas are decided by the District Manager of the Division of Industrial Safety. The District Manager may request the State Department of Health to assist in determining if an area should be classified as hazardous. Often the Health Department is better able to make certain kinds of technical evaluations because of the more sensitive instruments it has at its disposal and its greater experience in their use. The District Manager should be contacted first regarding the classifying of hazardous areas.

4. How can we expect a reasonable implementation of the OSHA when the compliance inspector is prosecutor, judge and jury and we are at the mercy of how he/she feels?

Answer: The Compliance Safety Engineer is not the prosecutor, judge, and jury. Many people become involved with inspections and their results. The Safety Compliance Engineer makes an inspection to determine if an employer is in compliance with the safety standards. The Occupational Safety and Health Standards Board determines safety standards—not the Compliance Safety Engineer. If an employer can prove that his workplace is as safe or safer by not complying with an order, he/she may obtain a variance from the safety standard from the Standards Board.

An employer may appeal to the Occupational Safety and Health Appeals Board if he/she wishes to contest the existence of a violation reported by the Compliance Safety Engineer.

All inspection reports are reviewed by a District Manager of the Division. Based largely on the Compliance Safety Engineer's report, the District Manager assesses the penalties—not the Compliance Safety En-

Continued on Page 7

COMBUSTION AT HIGH ALTITUDES

Walter A. Van Sandt
California State Department of Health

Could you light your pipe or back pack stove if you climbed to the top of Mt. McKinley next summer? In how high an altitude will a safety lamp, candle, match, campfire, etc., burn? A practical problem might be: could a hiker light a portable cook stove on the top of Mt. McKinley (altitude 20,000 feet)? Could a fire start among combustible substances in a non-pressurized cargo space of a plane flying at 40,000 feet?

As a first step in answering these questions, some of us have built camp fires in the Sierras at altitudes of 10,000 to 12,000 feet. December 31, 1971 the Mt. Everest climb of the Japanese mountain team was shown on television. The base camp was at 17,500 feet. On film wood fires were shown in the camp. Camp number one was established at 20,000 feet. There were a few television shots of candles burning. Camp number three was set up at 24,000 feet. At this camp there was a very good picture of candles burning. The last camp, number five, was at 28,000 feet. Food was cooked in this camp. The stoves were probably gas or liquid fired. This data is tabulated in the following Table 1:

TABLE I
Mt. Everest Climb

Camp no.	Elevation feet	Activities	Atmosphere pressure mmHg*	Partial pressure		% O ₂
				O ₂ mmHg	N ₂ mmHg	
Base	17,500	Wood fires	386	81	305	21
1	20,000	Candles burning	350	73	277	21
3	24,000	Candles burning	294	62	232	21
5	28,000	Cooking food	246	51	195	21

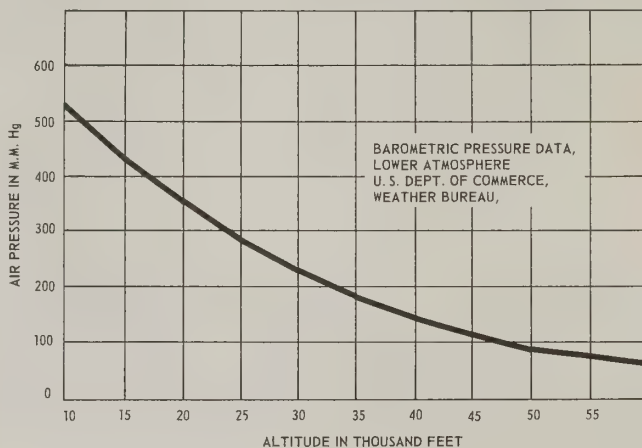
* Based on U.S. Department of Commerce Weather Bureau Tables.

Note in the far right column that the percentage of oxygen in the atmosphere is 21%, regardless of altitude. Imagine a very small box of air at sea level. Assume the box is of such size that it contains 21 trillion molecules of nitrogen. It would contain 21% oxygen. Next, assume the astronauts determined the number of molecules of oxygen and nitrogen in the same size box mounted outside their orbiting space laboratory. As there is a high partial vacuum in outer space, we will assume that they found only 21 molecules of oxygen and only 79 mole-

cules of nitrogen in the box; still 21% oxygen.

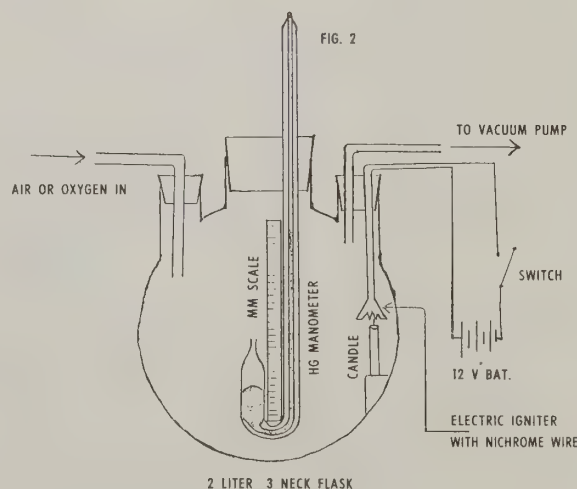
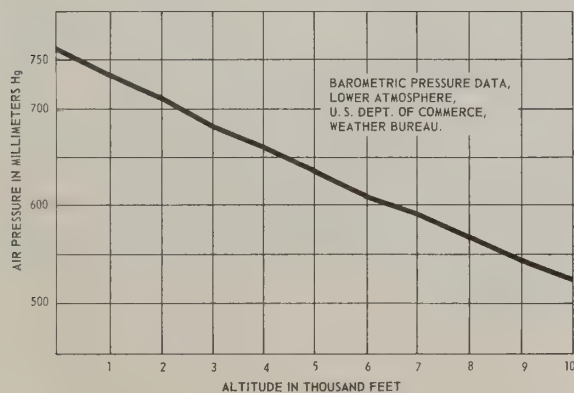
The most important aspect to consider regarding air at different altitudes is the barometric pressure of the oxygen and nitrogen. The average barometric pressure of the atmosphere from sea level to 60,000 feet in millimeters of mercury is shown in Figures 1a and 1b.

FIG. 1-b



To determine the altitude at which a burning candle will extinguish, we built and assembled the apparatus shown in Figure 2. A 2-liter, 3-neck Pyrex flask was fitted with a mercury barometer through the center neck. Two inlet tubes for nitrogen, oxygen, and/or air were fitted through one of the side necks. An electric igniter and outlet tube attached to a vacuum pump was assembled in the third neck. A candle was placed inside the flask on a support as shown. The candle was lit at ordinary atmospheric pressure (760 mm). The vacuum pump was turned on and the air flow into the flask adjusted to somewhat less than the pump pulled. This diminished the air pressure in the flask. It also swept most of the carbon dioxide generated from the candle out of the flask. This prevented the candle from being

FIG. 1a



Continued on Page 4

Combustion, Continued

extinguished in its own carbon dioxide.

Six trials were made to determine at what atmospheric pressure the candle was extinguished. The following Table 2 tabulates these trials. Altitudes in feet are given from Figure 1a and Figure 1b.

TABLE II
Candle Flame in Low Pressure Atmospheres

Air pressure which candle went out mmHg	Trail	Altitude in feet
122-----	1	42,500
117-----	2	43,500
97-----	3	47,500
92-----	4	49,000
92-----	5	49,000
82-----	6	50,500

Average = 100 mm Average = 46,500 feet = Approx. 9 miles

At ordinary pressures (760 mm) the candle burns with a yellow flame. As the pressure becomes reduced the flame has a blue bottom and yellow top. At lower pressures the flame is completely blue.

In answer to the questions at the beginning of this article, a hiker could light his cook stove on the top of Mt. McKinley, and a plane would have to fly somewhat higher than 40,000 feet to be safe from fire in the presence of an ignition source among combustibles. The figure usually given at which the composition of the air of a safety lamp is extinguished is approximately 16.0% oxygen.¹ Thus, a safety lamp goes out when the percent of oxygen in the air falls to 16.0%.

We can tabulate this data as follows:

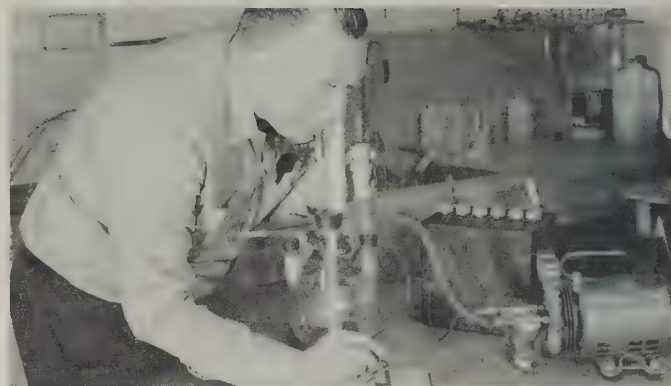
TABLE III
Partial Pressures of Oxygen and Nitrogen At Which Safety Lamp Burns and Becomes Extinguished

Safety lamp	Percent oxygen	mm pressure O ₂	Percent nitrogen	mm pressure N ₂	Altitude
Burns-----	21	160	79	600	Sea level
Out-----	16	121	84	638	Sea level

Note that when the partial pressure of oxygen drops to 121 mm and the partial pressure of nitrogen *increases* to 638 mm the lamp goes out.

It is *not* the lack of oxygen that extinguishes the lamp. It is an *excess* of *nitrogen* that extinguishes the lamp. Refer to Figure 2. The flask was flushed several times with pure oxygen to remove all the air. The vacuum pump was then turned on and the oxygen pressure reduced to 121 mm. This is equivalent to the oxygen pressure in air containing 16% oxygen at sea level. However, remember that there is *no* nitrogen in the flask; just pure oxygen at reduced pressure. When the electric igniter was touched to the candle, the candle burned rapidly with a brilliant flame. This shows that in the original atmosphere it is the blanketing or smothering effect of the nitrogen that puts the lamp out, not lack of oxygen. As the physical chemist sees it, the increased number of

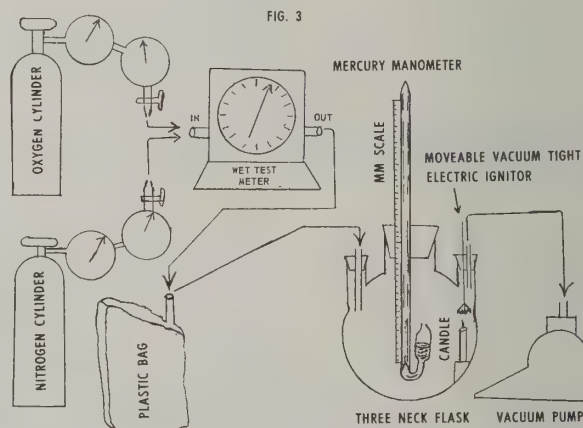
¹ From U.S. Bureau of Mines data at sea level conditions.



Author operating High Altitude Simulation Chamber

nitrogen molecules among the oxygen molecules prevents the oxygen molecules from entering into the combustion reaction. This is probably a good example of an application of the Law of Mass Action.

As noted above, a safety lamp, candle, etc., go out when the concentration of oxygen is around 16.0%; we assumed sea level conditions. The question came up regarding the behavior of flames at higher altitudes with varying concentrations of oxygen. For example, does a safety lamp or candle go out in an atmosphere of 16% oxygen at 12,000 feet? 17,000 feet? Do they continue to burn if the oxygen concentration becomes reduced to a lower value at these altitudes? To answer this question, the apparatus shown in Fig. 3 was assembled.



Atmospheres containing varying concentrations of oxygen and nitrogen were prepared. This was done by passing varying amounts of pure oxygen and pure nitrogen through a calibrated wet test meter into a plastic bag. The 3-neck flask apparatus shown in Figure 4 (also in Figure 5) was pumped down with a high vacuum pump until the pressure inside was less than 1 mmHg. The air mixture from the bag was slowly introduced into the flask until the desired pressure was obtained.

Table IV shows the results of these tests:

The U.S. Bureau of Mines Circular 33 reads on page 4 as follows: "The flame of a flame safety lamp or candle is extinguished at about 16.25% oxygen." No mention is made of altitude. Workers should be made aware of the fact that this figure does not necessarily hold true at higher altitudes.

Continued on Page 5

Division Of Industrial Safety Administrative Interpretations

The Division of Industrial Safety enforces the Safety Orders of the State of California. These Safety Orders are minimum safety standards. In adopting or amending any Safety Order the Standards Board lays down as specifically as possible the intent of the Order. In some cases during the enforcement procedure it becomes obvious that some Orders are open to interpretation by enforcement personnel. For purposes of consistency the staff of the Division of Industrial Safety provides a more detailed explanation on a section of a Safety Order.

The following Administrative Interpretations have been developed to further clarify the Safety Orders cited.

Ai-1 EFFECTIVE DATE 3/26/74

Subject:

Sloping or shoring of trenches for cast-in-place concrete pipe-laying machine operations.

Reference:

California Administrative Code, Title 8 Construction Safety Orders 1540 and 1541 Excavations and Trenches

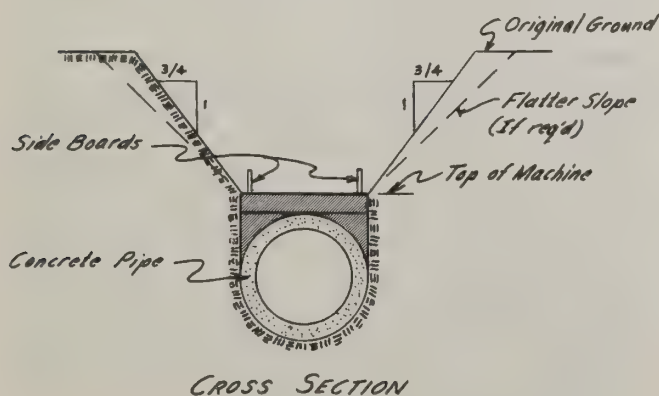
Background:

It has been noted that an administrative interpretation is needed regarding the specific trench side sloping to be utilized at job sites at those locations where a cast-in-place concrete pipe-laying machine is employed.

Interpretive Decision:

In order for these machines to function successfully, the trench must be excavated so as to conform with the cross-sectional configuration of the machine.

From the standpoint of operator protection from the hazard of trench cave-ins, the machine would function in a manner similar to that of a trench shield. When trench shields are used where the height of the trench is greater than that of the shield, the Division requires that the shield be extended or the portion above the shield be sloped back to the angle of repose of the material under excavation or at a slope ratio of $\frac{3}{4}$ horizontal to 1 vertical—whichever is greater.



Because these machines must operate of necessity in hard compact material, generally the $\frac{3}{4}$ to 1 slope ratio is sufficient and no additional shoring is required. However, if workmen are required to enter the area outside the confines of the machine, a shoring system designed to sustain the loads imposed by the combined vertical and sloping faces of the excavation would be required. If raveling material is encountered which exposes the machine operator to the hazard of being struck by rolling objects, then the addition of side boards to the machine would be required to eliminate the hazard.

Ai-2 EFFECTIVE DATE 8/1/73

Subject:

Markings on elevator controllers.

Reference:

Basic Electrical Regulations (excerpt from) Section E430-8. MARKING ON CONTROLLERS. A controller shall be marked with the maker's name or identification, the voltage, the current or horsepower rating, and such other data as may be needed to properly indicate the motors for which it is suitable.

For controllers which are an integral part of equipment approved as a unit, the above marking may be on the equipment name plate.

Background:

It has been noted during equipment inspections that motor controllers and starting switches of some manufacturers do not comply with the Basic Electrical Regulations governing sizing and marking of controller components.

Interpretive Decision:

It will be the policy of the Division to include in this requirement that the controllers shall be permanently marked with the voltage rating and the maximum horsepower for which they are designed, and that the horsepower rating shall not be lower than the horsepower rating of the motors that they control. This policy is in conformance with Section 2398(b) of the Electrical Safety Orders and with Section E480-83 of the Basic Electrical Regulations. Where necessary, the controllers shall be marked by the manufacturer to indicate that the maximum horsepower rating is to apply only to standard speed motors.

When used with Star-delta or reduced voltage starting, the controllers shall be marked by the manufacturer to indicate the maximum horsepower for which they are designed to be used under such conditions.

Ai-3 EFFECTIVE DATE 8/1/73

Subject:

Disconnecting means, Elevators.

Reference:

Basic Electrical Regulations.

E430-109 TYPE. *The disconnecting means shall be a motor circuit switch, rated in horsepower, or a circuit breaker.*

Background:

During the inspection of new elevators, it has been noticed many electrical contractors do not furnish motor circuit switches, rated in horsepower.

Interpretive Decision:

It will be the policy of the division to enforce the Basic Electrical Regulations, requiring a fused motor circuit switch rated in horsepower, for the disconnecting means described in Section E620-51. The division will not accept an ampere rated switch in lieu thereof. Nothing in this interpretation is intended to prevent the installation of a suitable circuit breaker for the disconnecting means.

Ai-4 EFFECTIVE DATE 8/1/73**Subject:**

Conversion of operating devices of the rod or rope type actuated directly by hand or rope operating devices actuated by wheels, levers or cranks to operating devices of the enclosed electric type.

Reference:

Elevator Safety Order Section 3040(a). Operation and Operating Devices.

(1) Operating devices shall be of the enclosed electric type. Rope or rod operating devices actuated directly by hand or rope operating devices actuated by wheels, levers, or cranks shall not be used.

EXCEPTION: *A period of five years after the effective date of these regulations will be allowed for the alterations to existing shipper rope operated elevators necessary to have the operating devices conform to the requirements of Section 3040(a)(1).*

Background:

The conversion from tiller rope operating devices to enclosed electric type operating devices is required by the Safety Orders and applies to many old elevators that were installed before 1947. It was the intent of the Code Committee in writing Section 3040(a)(1) and 3067 to eliminate the inherently hazardous tiller rope operation and not to require that all component parts of the elevators, as listed, in Section 3000(h)(5) be made to comply with the standards for new elevators.

Interpretive Decision:

Enforcement of Elevator Safety Order 3000(h)(5) when tiller rope conversions are made, shall be as follows:

3000(h)(5)(A). Existing hoistway doors and gates and their existing locking devices shall comply with the Safety Orders as the Orders apply to existing installations.

3000(h)(5)(C). Capacity and Loading.

Capacity and loading provisions shall be met except that

where the division is notified in writing before the conversion is made permission may be granted to retain the existing load rating for an existing platform area.

3000(h)(5)(D). Terminal Stopping Devices.

Terminal stopping devices shall meet the 1947 code as a minimum requirement.

3000(h)(5)(E). Emergency Signal Devices.

Where hoistway doors are provided, Section 3041(a)(1) shall be complied with for constant pressure operation.

3000(h)(5)(F). Electrical Protective Devices.

Electrical protective devices shall comply with the 1947 code and in addition a pit stop switch and where there is a car top, a stop switch on the car crosshead shall be provided.

3050(b). Machine Rooms and Machinery Spaces.

Machine rooms shall be provided except for existing machines that have been accepted as cabinet machines, even though a new control panel or pump is furnished, provided the control is mounted in a totally enclosed, lockable cabinet adjacent to the existing machine.

3073 and 3074.

The retroactive portion of Sections 3073 and 3074 requiring enclosed hoistways, hoistway gates, car sides, and bow irons shall be complied with at the time of the conversion. When space conditions prohibit full compliance, and the division is notified in writing before the work is begun, permission may be granted for partial compliance.

Ai-5 EFFECTIVE DATE 3/8/74**Subject:**

Conditional Acceptance of Pre-December 1962 Installations

Reference:

Electrical Safety Order 2305(c)

Background:

The technical staff has been questioned about Electrical Safety Order 2305(c). The question involves the clause which accepts conditionally a pre-December 1962 installation even though it may not conform to the 1962 Electrical Safety Orders.

Interpretive Decision:

Electrical Safety Order 2305(c) reads as follows:

“(c) New Installations: Additions, Alterations and Renewals of Existing Installations. New installations and additions and alterations to existing installations, which are made after these orders become effective, shall conform to all of the applicable orders herein. Existing installations in compliance with the 1934 Electrical Safety Orders will not be required to conform to these orders, except where the hazard presented by the installation is, in the judgment of the chief of the division, of such severity as to warrant control by the application of these orders.”

In surveying an electrical installation, the compliance safety engineer must make a judgment as to whether the installation is reasonably safe. Where the electrical installation was installed in compliance with then existing safety orders it should be considered to still be reasonably safe. This assures the installation and equipment has been maintained so that it still is in compliance with those safety orders it met at installation time.

The question could be posed about any Division of Industrial Safety Order. Electrical Safety Order 2305(c) reflects a general principal that a new safety order is not retroactive to existing situations. However, it provides for personnel safety by suspending the general principle where a severe hazard exists. It concerns the date of installation, not the date the place of employment opened its doors. It requires conformance with those Electrical Safety Orders in effect at the time the installation was made.

Where the compliance safety engineer finds an existing electrical installation he is not certain met current safety orders when installed, he should contact the Electrical Unit of the Engineering, Education and Research Staff for assistance.

Ai-6 EFFECTIVE DATE 11/8/73

Subject:

Administrative interpretation #472(e) Key operated self-service LP-Gas Dispensers.

Reference:

California Administrative Code, Title 8, Section 472 (e) (Unfired Pressure Vessel Safety Orders)

Background:

Some LP-Gas dealers provide key operated dispenser service. A key and an electric type credit card is given to the customer, who serves himself. A pump operating at 25 to 30 gallons per minute may be used to fill small containers, with a strong possibility of overfilling. There have also been reports of some spills. Safety order 472e requires at least one trained attendant. OSHA requires an attendant during transfer. Pamphlet 58, 1972 edition, also requires an attendant during all transfer.

Legal Counsel has reviewed this operation and the Safety Order, and is of the opinion that such customers, with the exception of trained transporters, are not attendants.

Interpretive Decision:

Where key operated self-service LP-Gas dispensers are found, requirements sections of 472(e) and 480(g) (3) will be written. 480(g) requires a manually operated shutoff valve located as close to the tank as practicable. 480(g) (3) reads, "The manually operated shutoff valve required by this order shall be closed except during transfer of liquid or gas."

Ai-7 EFFECTIVE DATE 11/28/73

Subject:

Grounding of Portable Tools and Equipment Supplied by Flexible Cords and Attachment Plugs.

Reference:

Section E250-45, Title 24, Basic Electrical Regulations
Section 2382, Title 8, Electrical Safety Orders

Background:

There has been confusion and misunderstanding over what equipment and tools require grounding. Field engineers are continually asking whether typewriters, adding machines, coffee pots, time clocks, electrically operated kitchen appliances, and space heaters, to mention a few, need grounding.

Interpretive Decision:

Exposed noncurrent-carrying metal parts of cord and plug connected equipment which are *likely* to become energized shall be grounded. This includes motor-driven portable hand tools, office machines, vending machines, time clocks, fans, hair dryers, fan assisted comfort heaters, vacuum cleaners and similar equipment as well as those types of heating appliances having exposed heating elements. Heating appliances having Cal-rod type enclosed elements would not require grounding.

Sections E250-45(a)(b) and (d) refer to some but not all of the typical types of equipment which shall be grounded. Section E422-12 requires the grounding of all heating appliances having metal frames. Certain heating appliances such as toasters and grills must necessarily have exposed current-carrying parts operating at high temperatures so as to perform their desired function.

The reasons for grounding these types of equipment are as follows:

1. Equipment which is motor-driven has a tendency for the motor carbon brush dust to build up over a period of time and to form a tracking path to and energizing adjacent noncurrent-carrying metal parts of the particular equipment, thereby exposing the user to possible electrical shock.
2. Equipment having heater strips, ribbons, or coils such as some types of coffee pots and convection type comfort heaters has a tendency for these strips, ribbons or coils to burn in two in normal use and have one or the other of these ends fall against adjacent noncurrent-carrying metal parts of the appliance. This is especially dangerous when these type of appliances are mounted on feet or bases of insulating type materials and many are so constructed. Should a person come in contact with the now energized noncurrent-carrying metal parts of a faulty appliance and simultaneously touched grounded working surfaces or equipment such as stainless steel counter tops, milk shake machines, water or gas plumbing equipment, cash registers and such which are normally grounded, he or she would be in series to ground with the result being at least a shock and at worst electrocution. There are numerous incidents of this very type of acci-

dent occurring with employees receiving shocks and burns needlessly. Some happenings have resulted in an electrocution.

Appliances using an enclosed or sheathed heating element of the Cal-rod type do not normally present the type of problem alluded to under #2 and therefore the grounding of adjacent noncurrent-carrying metal parts is not critical.

In addition, solid state circuitry types of business machines and calculators, not employing motor drives, are *not* required to be grounded because it is highly *unlikely* that circuit failure would lead to the energizing of adjacent noncurrent-carrying metal parts.

Underwriters' Laboratories Standard for Office Appliances and Business Equipment, UL 114, paragraph 143, reads in part, "All cord connected appliances and all permanently connected appliances shall have provision for the grounding of all exposed dead metal parts that might become energized." An exception to this does not require grounding for double insulated equipment. This UL Standard is also ANSI Standard X4.12-1970.

From the above it is obvious that equipment grounding is of the utmost importance for electrical safety and all field safety engineers should be apprised of the need to require equipment grounding except as noted above and where double insulated equipment is used.

Ai-8 EFFECTIVE DATE 3/11/74

Subject:

Definition of "Boiler".

Reference:

Safety Order 753(b), Labor Code 7621.

Background:

"Boiler" is defined in the Labor Code and in Safety Order 753(b) as a fired or unfired pressure vessel used to generate steam by the application of heat. In attempt to avoid attendance or permit requirements, some operators gave their boilers different names. To clarify the legal definition, a sentence was added to Safety Order 753(b), "This definition is intended to include steam generators and forced circulation boilers but excludes unfired evaporators". Soon some boilers were being called "evaporators". In 1957 "evaporator" was defined, using the definition in Webster's New International Dictionary, Unabridged, 1950, "An apparatus, usually closed, for driving off superfluous liquid, as in a concentration plant for sugar and syrup, in fruit drying, etc., or for evaporating liquid for subsequent concentration to purify it, as from salts held in solution."

There are some large unfired boilers, or heat exchangers, that are called evaporators. These are boilers within the definition of the Labor Code, and are not exempt from requirements for construction inspection or attendance.

Interpretive Decision:

Calling a boiler by another name does not exempt it from the definition in the Labor Code. The function of applying heat to generate steam or superheated water deter-

mines whether the object is a boiler.

Boiler feed water heaters are high temperature water boilers if the water is heated to pressures above 160 psi or to temperatures exceeding 250° F.

Ai-9 EFFECTIVE DATE 1/11/74

Subject:

Non-powered hinged loading ramps.

Reference:

General Industry Safety Order 3273(i) U. S. Department of Commerce, Bureau of Standards Commercial Standard 202-56.

Background:

It has been requested that interpretation of General Industry Safety Order 3273(i) be made concerning shear hazards relative to non-powered hinged loading ramps.

Interpretive Decision:

It will be the policy of the Division that the shear hazard is removed from the area between platform edge, and floor or pit edge, as provided in General Industry Safety Order 3273(i) and will be in compliance, whenever non-powered, counter-balanced, hinged loading ramps are designed, constructed and maintained to positively limit free fall speed to less than 10 feet per minute and with an unbalanced net weight not to exceed 20 pounds at the edge of the ramp.

Ai-10 EFFECTIVE DATE 4/10/74

Subject:

Intermodal Portable Cargo Tanks
American Society of Mechanical Engineers
Boiler and Pressure Vessel Code, Case 1598

Reference:

Code Case 1598

Unfired Pressure Vessel Safety Orders 467(a) and 560(c)

Background:

The above code case, which was approved by the A.S.M.E. Council on December 17, 1973, allows use of pressure relief devices that are set to open or rupture at 125% of the stamped pressure. This case is a result of an agreement by the U.S. Department of Transportation with an International Organization (IMCO). It provides for fabrication of shipping containers for bulk liquids to Section VIII, Division I, of the ASME Code. It does not require that the safety relief setting or relief capacity comply with the code. The tanks are expected to be pressurized only by vapor pressure of the product shipped, with maximum allowable working pressure not to exceed 48 psig, and temperature not to exceed 122°F. Code Case 1598 has wording that the tanks will be under the jurisdiction of the D.O.T. They shall not be installed at a fixed location, and shall not be refilled except for purpose of further transportation. Refilling shall be performed only at a location specifically designed and operated for that purpose.

Safety Order 467(a) requires that the safety valve must be set at or below the stamped pressure. 560(c) states

"compressed gases shall not be used to elevate or otherwise transfer any substance from or to a container unless the container(s) is/are designed to withstand the maximum possible pressure that may be applied with a factor of safety at least 4".

It is necessary to reconcile the conditions of Code Case 1598 with our safety orders, and the only way to do this is to require a safety valve of adequate capacity to prevent overpressure, and set at or below the stamped pressure, at each transfer point that will use any source of pressure, other than the product's own vapor pressure, to pressurize these containers.

Interpretive Decision:

A.S.M.E. Code tanks with Code Case 1598 on the nameplate may not be pressurized from an outside source during a transfer operation, except under the following conditions:

1. There must be installed on the inlet to the tank an A.S.M.E. Code safety relief valve, set at or below the maximum allowable working pressure. The safety valve may have a hand lift lever if the contents are not hazardous.
2. The relief capacity of the safety valve must be sufficient to prevent a pressure rise of more than 10% above the stamped pressure. The tanks must also be cleaned prior to refilling for shipment, whenever a chemical reaction is possible.

Ai-11 EFFECTIVE DATE 2/20/74

Subject:

Safety Relief Valves for domestic type water heaters.

Reference:

California Administrative Code, Title 8, Section 753 (1) (2) (g)

Background:

Safety Order 753 (1) (2) (g) requires either an A.S.M.E. or A.G.A. rated relief valve set at or below the maximum allowable working pressure on a domestic type water heater; the relief capacity must at least equal the stamped BTU/HR output of the burner.

Some Safety Relief Valves have both A.G.A. and A.S.M.E. ratings, and their stamped relief capacities are different. The A.G.A. rating is much lower, and would require a larger diameter relief valve.

Interpretive Decision:

For the purpose of this Safety Order the higher rated A.S.M.E. relief capacity is acceptable.

Ai-12 EFFECTIVE DATE 3/11/74

Subject:

Pressure-temperature rating of socket welded end valves.

Reference:

Boiler and Fired Pressure Vessel Safety Order 754; A.S.M.E. Code, Section I, Power Boilers, Paragraphs PG-42 and PW-41.5; ANSI Standard B16.5

Background:

There have been recurring problems with the pressure-temperature rating of socket welded end valves used in boiler installations. Installers use socket welded valves within the limits of the boiler at pressures and temperatures above those given in the Code or ANSI Standard B16.5, and these valves have to be replaced or the permitted pressure reduced. B16.5 was intended to apply only to flanged valves, but to date there is no similar standard for socket welded end valves.

PG-42.11 limits the use of ANSI socket welded "flanges" to 3" pipe size for 600 psi and lower classes, and 2½" for 900 and 1500 classes. PW 41.5 limits socket welded valves to 3" pipe size. In 1966 the ASME Boiler and Pressure Vessel Committee discussed the use of socket weld end valves, and agreed that the 1500 psi limitation did not apply to socket weld end valves. They also recognized that there was no uniform pressure-temperature rating, and were going to ask ASA to prepare a table. There is still no such table. Lacking guidance from the Code Committee, the Division has used Table PG-42 for pressure-temperature adjustment of valves.

Interpretive Decision:

Socket welded end valves up to 3" pipe size may be used on boilers, provided the proper pressure-temperature rating is stamped on the valve manufacturer's nameplate. If the valve does not have the proper pressure-temperature rating, Table PG-42 will be used.

As an example, a primary service rating of 300 psi could be accepted for saturated steam service at 630 psi; or at 515 psi for boiler feedwater or bottom blowoff line service.

Ai-13 EFFECTIVE DATE 1/25/74

Subject:

DIS Safety Jurisdiction in Sequoia National Park.

Reference:

Logging and Sawmill Safety Orders 8 Cal. Administrative Code 6250-6446

Background:

The question has been presented whether safety engineers can enforce safety laws and inspect logging operations conducted under federal supervision involving a private contractor with California employees in Sequoia National Park.

Interpretive Decision:

The conclusions reached are that the Division of Industrial Safety of the State of California does not have jurisdiction either to enforce safety laws or to inspect in regard to logging operations in Sequoia National Park. California ceded jurisdiction with reservations over Sequoia National Park in 1919 to the federal government. The jurisdictional reservations in the cession did not include the power to regulate places of employment. In addition, the Logging and Sawmill Safety Orders were enacted after the date of cession. Laws enacted subsequent to the cession have no applicability in the absence of a formal reservation.

For these reasons the DIS does not have jurisdiction to enforce safety orders and inspect places of employment in Sequoia National Park.

Ai-14 EFFECTIVE DATE 2/20/74

Subject:

Maximum water temperature for high temperature water boilers.

Reference:

Safety Order 753 (h) defines a high temperature water boiler as "A Fired or Unfired Pressure Vessel used to heat water to temperatures above 212° F at pressures exceeding 160 psi, or to temperatures exceeding 250° F regardless of pressure."

Safety Order 771 (a) (3) exempts high temperature water boilers from permit requirements and annual inspection if they comply with 771 b & 763 d.

763 d requires two controls with maximum temperature setting of 250° F, one with a manual reset.

Background:

Review of the committee discussions shows that it was not intended to limit high temperature water boilers to 250° F to make them exempt from state permit requirements. It was only intended that they have similar temperature controls to keep the temperature below the design criteria. This opinion has been confirmed by Mr. A. I. Snyder, who was Supervising Engineer, Pressure Vessels, at the time of these changes in 1966.

Interpretive Decision:

High temperature hot water boilers are not limited to 250° F in order to be exempt from annual inspection and annual state permits to operate. All other requirements of 763d must be met. The temperature controls required by 763(d) may be set at any temperature that does not exceed the design temperature of any part of the high temperature system. The high temperature limit control must be equipped with a manual reset.

Ai-15 EFFECTIVE DATE 2/20/74

Subject:

Definition of "Miniature Boiler".

Reference:

The 1971 edition of Section I, Power Boilers, of the A.S.M.E. Boiler and Pressure Vessel Code, in a footnote to paragraph PMB-2, defines "Gross Volume," "this Gross Volume is intended to include such gas passages as are integral with the assembled pressure parts and a simple definition is: The volume of a rectangular or cylindrical enclosure into which all of the pressure parts of the boiler in their final assembled positions could be fitted. Projecting nozzles or fittings need not be considered in the volume."

Safety Order 753(m) which pre-existed the A.S.M.E. definition, has this wording, "This volume includes the total volume of the steam and water parts of the boiler plus the volume of the combustion space and gas passages up

to the point of attachment of the smokestack or chimney breeching." In each case, the total volume is limited to 5 cubic feet.

Background:

Inquiries have been received from shops fabricating miniature boilers and from shop inspectors about possible conflict because of the difference in wording. The words, "Projecting Nozzles or Fittings", in the A.S.M.E. definition were the cause of some controversy.

The Pressure Vessel Staff will propose rewording 753(m) to correspond to the National Definition.

Interpretive Decision:

The A.S.M.E. definition of "Miniature Boiler" means substantially the same as that in 753(m), and is considered as providing equivalent safety.

Ai-16 EFFECTIVE DATE 3/11/74

Subject:

Marking of Double Insulated Tools.

Reference:

Title 8, Section 2382, Exception No. 2.

Background:

The Technical Staff has been asked to interpret the term "distinctively marked" as it appears in the last sentence of Section 2382, Exception No. 2.

Interpretive Decision:

The requirements for "distinctively marked" are spelled out in Underwriters' Laboratories, Inc. Publication 45, Sections 389 through 392 and reproduced below.

"MARKINGS

"389. A tool that complies with these requirements shall be permanently marked with the words "double insulation—when servicing, use only identical replacement parts." The words "double insulated" may be used instead of "double insulation" in the marking.

"390. The "double insulation" or "double-insulated" marking mentioned in paragraph 389 is to be:

- A. On a metal nameplate in letters at least $\frac{1}{16}$ -inch high that contrast in color with the background (see paragraph 391); or
- B. Molded into the enclosure in letters at least $\frac{3}{32}$ -inch high and raised or recessed 0.005 inch, or
- C. In a permanent polyethylene terephthalate label in letters at least $\frac{1}{16}$ -inch high that contrast in color with the background (see paragraph 392).

Added paragraph 390 effective June 30, 1973

"391. A metal nameplate as mentioned in item A of paragraph 390 is to be secured by rivets or one-way screws.

Added paragraph 391 effective June 30, 1973

"392. A polyethylene terephthalate label as mentioned in item C of paragraph 390 is to be recessed or otherwise positioned so as not to be subject to abrasion.

Added paragraph 392 effective June 30, 1973"

The Division will require the words "double insulated" or "double insulation" to be permanently marked on the tool. The markings shall be visible. The Division will not accept any symbol in lieu of the words "double insulation" or "double insulated".

Ai-17 EFFECTIVE DATE 3/11/74

Subject:

Approved Electrical Equipment.

Reference:

Electrical Safety Order 2306(a).

Background:

The technical staff has been questioned on Safety Order 2306(a)'s requirement for approved materials and equipment. The questioner was concerned with unapproved foreign materials being installed in places of employment. He asks if present practice is acceptable, and if so, by what criteria will Division of Industrial Safety judge the equipment to be safe.

Interpretive Decision:

The questions could have been asked about all materials and equipment no matter what their source. The answers to these difficult questions lie in understanding Safety Order 2306(a)'s objective and its administrative practicality.

The objective of requiring approved materials and equipment is to protect the ultimate user and maintenance men from electrical shocks and burns. This objective has not changed over the years.

The practicality of the order has changed with time. When the order was introduced, it applied to relatively noncomplex goods such as building wire, motor controllers and hot water tanks. These goods generally are mass produced and can be tested in an independent laboratory at low cost.

When more complex goods arrived on the market, the practicality became questionable because many of these goods are one of a kind, and are difficult to test because of their complexity. For example, process control systems with large expansion capabilities can't be tested for all contingencies economically because of numerous interrelationships.

Thus we must conclude that the order should be applied judiciously. The Division will:

- 1) Require common usage low voltage wiring materials (raceways, boxes, conductors) to be approved by a nationally recognized independent laboratory.
- 2) Accept high voltage wiring materials that has been tested by its manufacturer in accordance with a nationally recognized standard.
- 3) Accept equipment that has been tested by its manufacturer in accordance with commonly accepted industry practices. Such acceptance is contingent on the equipment being installed in accordance with the Electrical Safety Orders.

Ai-18 EFFECTIVE DATE 3/21/74

Subject:

Controls for hot water heating or supply boilers and for coil type, forced circulation boilers.

Reference:

Boiler and Fired Pressure Vessel Safety Order 763(d) (1 and 2) Circular Letter B-67-5.

Background:

Safety Order 763(d)(1) reads, "(d) All automatically controlled low-pressure boilers shall be equipped with: (1) A low-water control that will close the main burner fuel valve when the water in the boiler reaches the lowest operating level, or for boilers with no fixed steam or water line, when the highest permissible operating temperature is reached."

This was thought by some installers to apply to hot water heating or supply boilers. The water line of a hot water heating boiler is in an expansion tank. Hot water supply boilers have no water line. They therefore tried to delete two required low water controls, since they already had two temperature controls.

Circular Letter B-67-5 was issued to clarify two points: (1) Hot water heating or supply boilers require two water sensing devices. (2) Coil type, forced circulation boilers, where water flashes to steam at some point in the coil, may be installed with two temperature sensing devices, in lieu of low water cutoffs.

Interpretive Decision:

Hot water heating boilers and hot water supply boilers must be installed with the low water cutoff devices required by Safety Orders 763(d) (1 and 2).

Coil type, forced circulation steam boilers may be installed with temperature control devices in lieu of low water cutoff devices.

A flow switch may be used as the operating control required by 763(d)(1) for coil type steam or hot water boilers.

Ai-19 EFFECTIVE DATE 7/23/74

Subject:

Class 2 Refrigerant—Refrigeration Systems—Industrial Occupancies.

Reference:

*California Administrative Code, Title 8
General Industry Safety Order 3248 (g) and (i)*

Background:

Safety Order 3248 (g) which prescribes conditions for use of Group 2 refrigerants in refrigeration systems in Group A, B, C, D, F, H, and I occupancies does not require a machinery room for direct systems but does limit the amount of Group 2 refrigerants in such systems in those occupancies, in accordance with Table 15-1-B. 3248 (g)(3) does require a machinery room for indirect systems using Group 2 refrigerants in amounts not in excess of the amounts listed in Table 15-1-C in the speci-

fied occupancies, i.e., A, B, C, D, F, H, and I. 3248 (g) does not address Group G (Industrial) occupancies.

Safety Order 3248 (i) addresses industrial (Group G) occupancies as does its source ANSI B9.1-1971, Section 7. 3248 (i) specifies that "there shall be no restriction on the quantity or kind of refrigerant used in Group G (Industrial) occupancies except as specified in 3248 (i) (2) and (4). 3248 (i) (2) specifies that "when the number of persons in a refrigerated space, served by a direct system, exceeds one person per 100 square feet, the requirements of Group F (Commercial) occupancy shall apply unless the refrigerated space containing more than one person per 100 square feet is provided with the required number of doors opening directly into approved building exits, such refrigerated space shall be cut off from the rest of the building by tight construction with tight fitting doors." 3248 (i) (4) specifies certain restrictions on certain Group 2 (no ammonia) refrigerants and Group 3 refrigerants.

Interpretive Decision:

Section 3248 (g) requires a separate machinery room with Class 1 electrical installations in occupancy classifications A, B, C, D, E, F, H, and I (but not G) for indirect refrigeration systems using Group 2 refrigerants. Direct systems using Group 2 refrigerants do not require a machinery room for those occupancies.

Section 3248 (i) does not require a separate machinery room for Group G (Industrial) occupancies for either direct or indirect systems using ammonia, dichloroethylene or sulphur dioxide unless the occupancy and exit conditions of 3248 (i) (2) are violated, in which case the requirements for Group F (Commercial) occupancy would apply.

The above interpretation was not complete enough to answer some of the questions that might arise as to when a machine room is required.

- (1) This issue adds that *indirect* as well as direct systems are acceptable without machine rooms for industrial (Group G) occupancies using certain Group 2 refrigerants.
- (2) It has been added that the Group F (Commercial) requirements are to prevail at industrial establishments failing to satisfy certain occupancy and exit limitations.
- (3) Also added is the interpretation that *indirect* systems in most occupancies other than G must have separate machinery rooms (Class 1 electrical) if using Group 2 refrigerant.

Ai-20 EFFECTIVE DATE 3/14/74

Subject:

Approved Spiders for Motion Picture Production.

Reference:

Title 8, Section 2306.

Background:

Field Safety Engineers will encounter special purpose cable splicing blocks (spiders) for motion picture pro-

duction. Spiders which carry the Underwriters' Laboratories, Inc. label are acceptable to Division of Industrial Safety.

Interpretive Decision:

Division field compliance safety engineers enforcing safety regulations in places of employment will not cite studio employers using these new spiders provided that when used off motion picture studio premises, these spiders will be used under controlled conditions when they are energized.

Ai-21 EFFECTIVE DATE 3/22/74

Subject:

Use of automatic back-up warning devices on double bottom dump trucks.

Reference:

*California Administrative Code, Title 8
Construction Safety Order 1592
Warning Devices.*

Background:

There is a need for uniformity in the application of Construction Safety Order 1592 as it relates to the operation of double bottom dump trucks.

Interpretive Decision:

The clear intent of Construction Safety Order 1592 (a) is to provide protection to other employees in the vicinity of the vehicle when it is backing.

Double bottom dump trucks fall within the provisions of this safety order (providing they have a capacity of 2½ yards or more) and are required to be equipped with a warning device that operates automatically while the vehicle is backing.

Ai-22 EFFECTIVE DATE 3/28/74

Subject:

Duct Heaters Workspace & Accessibility

Reference:

Electrical Safety Orders 2412 (g) and 2475

Background:

The Division of Industrial Safety continually finds violations of required workspace and access to the electrical control and protective equipment for duct heaters installed in the ceiling spaces of buildings.

We have found contactors, fused disconnecting switches, circuit breakers, thermal protective devices, solid-state controllers, control fuses, relays, etc., installed on or immediately adjacent to the heating units on the duct system in inaccessible spaces above the ceilings.

In most instances, these ceilings consist of T-bar construction with lift-out panels measuring approximately 2 feet by 4 feet. The controls are installed 3 feet to 5 feet above the T-bars, and in almost all instances access to the equipment is further impaired due to other ducts, conduits, plumbing, sprinkler systems, etc., installed above the ceilings.

Interpretive Decision:

Sufficient access and working space must be provided and maintained about all electrical control and protective equipment to permit ready and safe operation, examination, adjustment, servicing, or maintenance.

A person attempting to work on electrical equipment from a ladder or other portable device would find himself surrounded by the grounded T-bars. With the additional grounded surfaces of the piping and other utilities in the ceiling, accessibility is not safe, either mechanically or electrically.

The Division of Industrial Safety does not interpret the State regulations as allowing electrical control or protective equipment to be installed in such locations, nor does it consider equipment located in such locations as meeting the requirements for a reasonably safe installation.

Ai-23 EFFECTIVE DATE 8/23/74**Subject:**

Sewage Pumping Station
REVOKED

Ai-24 EFFECTIVE DATE 3/28/74**Subject:**

Prefabricated Branch Circuit Power Distribution Assemblies

Reference:

Electrical Safety Order 2306

Background:

Division field compliance engineers will encounter prefabricated branch circuit power distribution systems.

These systems are being used to supply outlets in movable partitions in schools and office buildings. They provide a metal enclosed wiring system which affords safety as well as flexibility.

Each system consists of a distribution unit installed above a hung ceiling and connected to a panelboard by conventional wiring installed in a metal raceway. From the distribution unit the system goes flexible. Prefabricated cable sets installed in flexible metal conduit connect the distribution unit with switching, lighting units and terminal equipment.

The distribution unit can handle lighting, switching, convenience outlets, and programmed clock systems, public address systems, audio visual systems, television and alarm systems.

Power and signals are carried through the flexible wiring system to movable or fixed partitions, power columns, communication panels and other locations.

Connectors are so designed that there is no interchangeability between different systems. No live parts are exposed when the connectors are removed from the receptacles. Connectors and receptacles are color coded for easy identification by voltage and function.

Interpretive Decision:

These prefabricated field distribution assemblies, free standing columns, and enclosures are listed by Underwriters' Laboratories, Inc., and are acceptable to the Division of Industrial Safety.

Field compliance safety engineers will not cite the prefabricated branch circuit power assemblies where they are installed properly in places of employment.

Ai-25 EFFECTIVE DATE 3/29/74**Subject:**

Portable and Movable Equipment

Reference:

Electrical Safety Order 2361(a)(6)

Background:

The technical staff has been asked for a definition of the terms "portable" and "movable" as they relate to electrical equipment.

The definitions are needed because the Electrical Safety Order limits the use of flexible cords for wiring of equipment. Electrical Safety Order 2361(a)(6) allows cords for connection of portable or movable equipment or moving part of fixed equipment.

Interpretive Decision:

Portable equipment shall be defined as equipment capable of being readily moved by one person.

Movable equipment shall be defined as equipment mounted on tracks and/or wheels or casters for the purpose of being conveyed between locations within a place of employment.

Ai-26 EFFECTIVE DATE 4/22/74**Subject:**

Wiring for Movable Batch Processing Plants

Reference:

Electrical Safety Order 2362

Background:

Movable batch (concrete, asphalt) processing plants are used on construction sites. These plants may be built in sections so they can be moved from one job site to another.

The plant may contain electrical equipment which must be removed before the plant is moved. These plants use flexible cord for temporary wiring because (1) electricians are unavailable in rural areas and, (2) differences in work sites prevent standardized machine arrangement.

This temporary wiring gradually evolves into a haphazard maze of cables draped or hung over steel work, run around on the ground where vehicles drive, or lying on passageways where they are subject to abrasion and present a tripping hazard.

Interpretive Decision:

The Division of Industrial Safety will accept two methods of wiring batch processing plants to eliminate the

personnel safety hazards and to facilitate plant startup. The first (and more desirable) is to wire each movable section of the plant with a permanent class of wiring in metal raceway, using materials and fittings approved for exposure to weather. Connections between the wiring on sections would be accomplished by short pieces of portable cable, such as Type S, ST, or SO. This facilitates a quick setup and helps eliminate errors in connections. All metal sections which are not mechanically connected together must be bonded together electrically to prevent a difference of potential between such sections.

The second method is to extend the circuits from the motor controllers (at the distribution center) to motor locations by means of multi-conductor Type S, ST, or SO cables. These cables must be routed to avoid situations where they are subject to abrasion or physical damage. They must be supported along conveyors and framework by metal trays, channels, or fastened along the webs of I-beams. Trays should be of expanded metal or ladder type to prevent the collecting of sharp rocks; or covers should be installed at locations where such material is falling.

Where subject to displacement or tension, the cables shall be secured by use of Kellems grips or by cleats of wood or insulating material. Metal wire and such shall not be used to support or secure such cables.

Cables shall not lie exposed on surfaces where they will be subject to frequent walking on or to vehicular traffic. Where cables cross driveways or pathways, they may be buried under a few inches of soil. Cables may be terminated by suitable attachment plugs or receptacles or by direct connection to terminals in suitable enclosures. For voltages over 300 (between phases), plugs shall be the skirted type.

Where cables are brought into boxes through knockouts, they shall enter through approved cord grips or clamping devices. Where direct connection to terminals is the procedure, each stranded conductor shall have a terminal lug permanently crimped on. It is recommended that stranded or extra flexible conductors be used for either conduit wiring or portable cables. This avoids damage to insulation and breaking of solid conductors by vibration.

Plugs and receptacles, push-button stations, etc., shall be of weatherproof types or shall be located in positions sheltered from the weather. Switches, motor starters, and associated plugs and receptacles shall be identified with durable paint or other permanent means to indicate the load they supply. Smaller sized cables shall be connected with smaller plugs to prevent inadvertent overloading of these small cables.

All wiring enclosures and equipment must be grounded—either by being securely fastened to the grounded metal framework of the plant, or by means of an additional grounding conductor in the cable where the enclosure is isolated from the metal framework.

Ai-27 EFFECTIVE DATE 4/24/74

Revised 11/4/74

Subject:

Guarding of Fittings & Piping on LP-Gas Transport and Bulk Delivery of Tanks.

Reference:

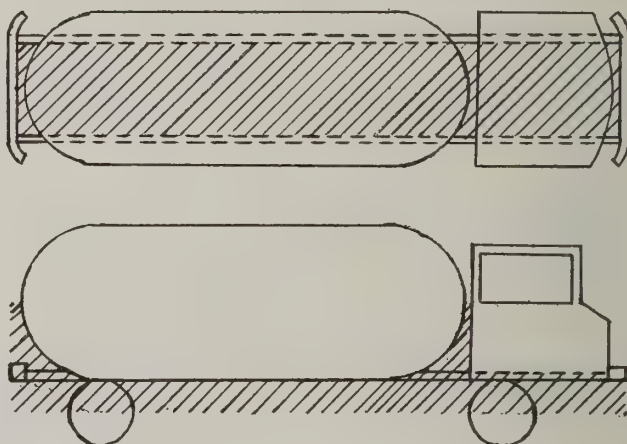
Unfired Pressure Vessel Safety Orders 479(d) and 479(h)

Background:

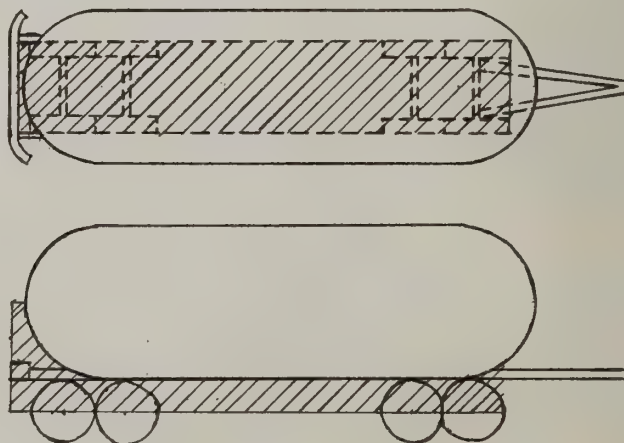
The words "Adequately Guarded" in the Safety Orders 479(d) and (h) have led to differences of opinion about what is adequate. The intent of the orders is to prevent damage to fittings in the event the truck or trailer is involved in an accident. Adequate guarding must be equivalent to the protection provided by a recessed well. All pipe and fittings outside of the frame and bumpers must be guarded.

SHADED AREAS DENOTE RECTANGULAR "BOX"
WHICH MAY CONTAIN UNGUARDED
PIPING AND FITTINGS

TANK SUPPORTED BY FRAME



FRAMELESS TANK - EXCEPT FOR REAR
BUMPER, "BOX" IS BETWEEN AXLES
AND BOTTOM OF TANK



Interpretive Decision:

All Non-Recessed piping and fittings outside the rectangular area formed by the frame and bumpers, and all parallel planes that are vertical from the frame and bumpers up to the center line of the tank, must be guarded. The guarding must be firmly attached to the frame or its extension. All parts shall be designed to withstand static loadings in any direction equal to eight (8) times the fully loaded weight of the tank and its attachments. The minimum ultimate tensile strength of the guard material shall be used in the design calculations. The lower plane of the rectangular "box" is at the level of the axles, when the unit is fully loaded.

For frameless units, fittings between the outside of the outer wheels, and above the plane of the axles when fully loaded, are considered to be protected by position.

Ai-28 EFFECTIVE DATE 4/29/74**Subject:**

Energy cutoff for domestic type storage water heaters.

Reference:

Safety Order 753(l)(2)(d); Circular Letter B-63-1.

Background:

Since 1963 the State Housing Law required a water temperature limiting device on storage water heaters, in addition to the primary operating control, that would shut off the source of energy at or below 210° F.

In December 1966, Safety Order 753(l)(2)(d) required, "A non-adjustable control . . . set to shut off the heat input when the temperature at the top of the heater is 210° F. or less. This control and the necessary fuel valve, switch, etc. shall be separate from the operating mechanism . . ."

Requirements have been written to install combination pressure-temperature relief valves on storage water heaters equipped by the manufacturer with a high energy cutoff. While a pressure-temperature relief valve is acceptable, only the pressure relief valve is mandatory for a heater equipped with an energy cutoff.

Requirements have also been written to install energy cutoffs or pressure-temperature relief valves on heaters that were installed prior to 1966. Only a pressure relief valve was required at the time of installation.

While greater safety may be obtained with the extra controls, such requirements exceed the Division's authority.

Interpretive Decision:

Combination temperature-pressure relief valves are not required on storage water heaters having a high energy cutoff. Only a pressure relief valve is required on such heaters.

Safety Order 753(l) does not require an energy cutoff on installations installed prior to December 1966.

Ai-29 EFFECTIVE DATE 4/29/74**Subject:**

Cranes.

Reference:

Construction Safety Order 1582.8(a)

General Industry Safety Orders 4902(a) and 4928(a)

Background:

Construction Safety Order 1582.8(a) and General Industry Safety Orders 4902(a) and 4928(a) require that: "When using recommended boom hoist reeving with rated loads suspended, the boom hoist shall be capable of raising the boom and holding it stationary without attention from the operator, and lowering it only when coupled to its prime mover."

Interpretive Decision:

For the purpose of this Safety Order, the use of positive interlock between clutching controls and braking controls on boom hoist which requires that either the boom hoist clutch mechanism or the boom hoist brake mechanism be engaged at all times, will satisfy the requirement that the boom hoist mechanism shall allow the lowering of the boom only when coupled to its prime mover.

Ai-30 EFFECTIVE DATE 4/29/74**Subject:**

Two Hand Controls for Point of Operation Guarding.

Reference:

General Industry Safety Order 4226(h)

Background:

Question has been raised whether the word "simultaneous" as used in General Industry Safety Order 4226(h) is meant to require "instantaneous" activation of multiple controls or merely "concurrent" activation of the controls.

Interpretive Decision:

The Division of Industrial Safety interprets the phrase, "simultaneous and continuous use of both hands being required", as used in General Industry Safety Order 4226(h), to mean that the control device (devices) must be actuated during a corresponding time frame, and continuously during the time of ram or point of operation closing or until the closing no longer presents a shear or crushing hazard and to require recycling of all the controls before a new machine cycle can be accomplished.

Ai-31 EFFECTIVE DATE 4/29/74**Subject:**

SCAFFOLDING

- (a) Use of exterior grade plywood as a scaffold sill in lieu of a 2" x 10" x 10" piece of material.
- (b) Use of "X" bracing on metal scaffolds in lieu of standard guardrail protection.

Reference:

*California Administrative Code, Title 8
Construction Safety Orders*

(a) *Section 1644(d)*

(b) *Section 1644(f)*

Background:

During the inspection of scaffolding, the following questions have been presented:

- (a) Would a piece of 1½" x 10" x 10" exterior grade plywood be acceptable as being the equivalent of a 2" x 10" x 10" base?
- (b) Under what conditions would the use of "X" bracing on metal scaffolds be acceptable in lieu of standard guardrail protection?

Interpretive Decision:

- (a) The use of a piece of 1½" x 10" x 10" exterior grade plywood under the metal base plate supplied by the scaffold manufacturer shall be deemed to be the equivalent of a piece of material 2" x 10" x 10".
- (b) The "X" bracing must afford protection equivalent to that of the standard guardrail which it replaces. Therefore, in order for the "X" bracing to be effective in preventing falls from scaffold work platforms, the intersection point of the "X" shall be no more than 45 inches nor less than 36 inches above the platform work level. If these dimensions are exceeded, the addition of a guardrail at the standard height of 42 to 45 inches would be required.

Ai-32 EFFECTIVE DATE 5/1/74**Subject:**

Receptacle Grounding

Reference:

Electrical Safety Orders 2340(o), 2340(p), 2382, 2383(f)(2), 2383(g) and 2387(c)

Background:

Some of our compliance personnel are not enforcing the grounding of exposed noncurrent-carrying metal parts of cord and plug connected equipment which are liable to become energized as required by Electrical Safety Orders 2382.

The compliance engineer uses a receptacle circuit tester and finds the grounding contact in the receptacle is not effectively grounded. He mistakenly assumes that, since Electrical Safety Order 2383(g) does not specifically state that the grounded contact in the receptacle shall be effectively grounded, that this is not necessary. This results in an open equipment grounding conductor and thus the requirement of 2382 is not accomplished.

Electrical Safety Order 2383(g) is being revised by adding a second sentence to read:

- (g) Receptacles. Receptacles intended for general use (except clock outlets) shall have an additional contact in the receptacle for grounding purposes.
Receptacles and cord connectors having ground-

ing contacts shall have those contacts effectively grounded.

Interpretive Decision:

The intent of Safety Order 2383(g) can be found by consulting Safety Orders 2382, 2383(f)(2), 2340(o), 2340(p) and 2387(c).

Electrical Safety Order 2382 requires that exposed non-current-carrying metal parts of cord and plug connected equipment, which are liable to become energized, shall be grounded.

Electrical Safety Order 2383(f)(2) provides that non-current-carrying metal parts of portable equipment shall be grounded by means of a grounding conductor run with the circuit conductors in cable assemblies or flexible cords supplying the portable equipment. Where an approved multiprong plug is used, one prong shall be for the purpose of connecting such grounding conductor to the grounded metal raceway or cable armor. It further requires an additional contact to be provided in the receptacle for grounding purposes.

Electrical Safety Order 2340(o) requires the grounded metal raceway enclosing the permanent fixed wiring to the outlet box containing the grounding type receptacle to be metallically joined together into a continuous electrical conductor and shall be so connected to all boxes, fittings and cabinets so as to provide effective electrical continuity.

Metal raceways, cable armor and fittings are required to be grounded by Electrical Safety Order 2340(p).

The grounding of exposed noncurrent-carrying metal parts of equipment is accomplished through connecting an equipment grounding conductor between the grounding electrode at the service equipment and the metal parts in question.

Electrical Safety Order 2387(c) requires the grounding conductor to be connected to the equipment to be grounded by means of suitable lugs, pressure connectors, or other approved means.

The Division of Industrial Safety will require that all receptacles having an additional contact in the receptacle for grounding purposes shall have an effective electrical connection to the equipment grounding conductor.

Ai-33 EFFECTIVE DATE 4/26/74**Subject:**

Bottom Loading of Tank Trucks with Flammable and Combustible Liquids

Reference:

Petroleum Safety Orders—Refining, Transportation and Handling

Article 5, Section 6775, Static Electricity

N.F.P.A. Volumes 1 and 9 (1973-74)

Sections 5532, 5535, 5536 and 6243(c)

Background:

The staff has been asked to interpret Petroleum Safety Order 6775 as to the applicability of bonding tank trucks during bottom loading operations to prevent the accumulation of electrical charges.

Interpretive Decision:

The Division of Industrial Safety will *not* require bonding of tank trucks during bottom loading operations of flammable or combustible liquids, when such loading is through closed connections, whether the hose or pipe is conductive or nonconductive. Closed connections shall be made by a secure device that will prevent leakage of flammable vapors or gases.

Ai-34 EFFECTIVE DATE 3/9/74**Subject:**

Receptacle Adapters.

Reference:

Electrical Safety Orders 2306, 2382.

Background:

The electrical industry is undergoing an extended transitional period for converting 15 and 20 ampere, 125 volt ungrounded (2 pole) to grounded (3 pole) receptacles. During this period many adapters have been marketed to: (1) allow continued use of existing 2 poles receptacles; (2) provide a 3 pole mating receptacle for the 3 pole plug on portable cords supplying tools and appliances; and (3) connect one of the three contacts of the adapter to an existing equipment grounding conductor.

Interpretive Decision:

The first two purposes for using adapters have been discussed numerous times in the technical literature. The third purpose involves an important personnel safety element—equipment grounding conductor.

The equipment grounding conductor must be continuous and possess a high reliability if it is to carry fault current when a tool or appliance grounds out to the metal enclosure.

The equipment grounding conductor is nonexistent in many wiring systems, e.g. knob and tube, and ungrounded nonmetallic sheathed cable. An adapter which connects its grounding contact through the receptacle cover mounting screw may provide employees with a false sense of security if the equipment grounding conductor is absent in the branch circuit.

Even though the equipment grounding conductor may be reached via the mounting plate screw, the use of adapters is not advisable. The adapter mounted external to the receptacle outlet box is also subject to physical damage which degrades its reliability as a reasonably safe device.

The Division of Industrial Safety will not allow the use of 2 pole to 3 pole grounding type adapters. The Division will require 3 pole grounding type receptacles for all single phase 120 volt branch circuits.

Ai-35 EFFECTIVE DATE 5/28/74**Subject:**

Attendance on boilers. High and low water level alarms.

Reference:

Boiler and Fired Pressure Vessel Safety Order 781(b).

Background:

Prior to 1955 all high pressure boilers required constant attendance. Old Safety Order 941 read,

“No boiler while in active service shall be left unattended, regardless of whether or not it is equipped with automatic feed regulator, fuel and damper regulators, high and low water alarms, or any form of automatic control. By ‘active service’ is meant that portion of time when the main stop valve is open and the fires are burning.”

In 1955 Safety Order 941 was changed to 781(b) and reworded to allow a maximum interval of 60 minutes that the boiler attendant could leave the boiler, under certain conditions, and if additional controls were installed and maintained in good operating order. The 60 minutes is a *maximum* interval; the actual period is no longer than the time it takes the water level to drop from the normal operating level to the lowest permissible level in the water gage glass.

781(b)(1) and (2) read,

“(b) While in operation, no fired boiler subject to these orders (except those boilers exempted from annual inspection by Order 771 that are automatically controlled and oil field recovery heaters complying with subsection (d)) shall be left unattended for a period of time longer than it will take the water level to drop from the normal operating level to the lowest permissible water level in the water gage glass—or indicated by indicating devices or recorders—when the feedwater is shut off and the boilers are forced to their maximum capacity unless all of the following are complied with:

(1) The boiler is equipped with an audible alarm that will operate when the water reaches the highest and lowest permissible operating level, or, for boilers having no fixed steam or water line, when the highest permissible operating temperature is reached.

(2) The audible alarm shall be sufficiently loud that it can be plainly heard at the most remote point from the boiler that the attendant is required to work.”

Some companies have left their boiler operating at night without an attendant. In large plants, with an attendant on the premises, he may be assigned other duties away from the boiler. A.D.T. alarms, paging systems, beepers and similar devices have been used in such plants to summon the boiler attendant in event of an operational upset. The use of such devices is *not* acceptable as complying with 781(b)(2). Such practice has resulted in dry fired boilers, explosions and injury to personnel.

Interpretive Decision:

The intent of Safety Order 781(b) is that the high and low water alarm must be plainly heard by the attendant's

own ears. He must be close enough to the boiler room so that he can safely respond to the alarm. The response time is that period of time that it takes the water level to drop from the level at which the alarm sounds down to the lowest permissible water level of the boiler. Similarly, the high water level alarm must be set so that the attendant will have time to respond before there will be carry-over from the boiler. The use of devices such as A.D.T. alarms, paging systems, beepers and similar, to summon the attendant are *NOT* acceptable as complying with Safety Order 781(b)(2).

Ai-36 EFFECTIVE DATE 6/13/74

Subject:

Telephones in Class I, Division 2, Hazardous Locations

Reference:

Electrical Safety Orders, Article 22

Background:

The Division has studied Underwriters' Laboratories Fact Finding Report E12213 dated June 12, 1964, on Bell Systems Models 500C, 500D, 554A, and 554B telephone sets for use in Class I, Division 2, hazardous locations.

Interpretive Decision:

Based on the information and test data contained in this report, Bell System Models 500C, 500D, 554A, and 554B telephone sets will be acceptable to the Division of Industrial Safety for use in Class I, Division 2, hazardous locations as provided for in the Electrical Safety Orders.

Ai-37 EFFECTIVE DATE 6/13/74

Subject:

Oil Well Platform Drilling

Reference:

Electrical Safety Orders, Article 22

Background:

Oil well drilling using electric drives may be done from platforms over water, from man-made islands offshore, or from land-based locations onshore. Often those platforms over the water are open to the atmosphere and are well ventilated at all times around the drilling operations.

Interpretive Decision:

Locomotive or "traction" type motors and generators have been adapted to oil well drilling and are becoming common in this field.

The Division of Industrial Safety considers the area within 50 feet of the casing of all oil wells in the process of drilling as a Class I, Division 2 hazardous location.

All electrical wiring and equipment within this area must comply with the requirements for Class I, Division 2 locations.

Those enclosed areas supplied with positive pressure ventilation from a non-hazardous area may be classed as non-hazardous areas. General-use equipment and wiring may

be installed in such pressurized areas in lieu of the more restrictive requirements for Class I, Division 2 locations. Suitable wiring methods become complicated in supplying a drilling rig which may drill a large number of holes from a single platform. One or more drilling rigs are used in this operation and move to new holes on the platform. Both A.C. and D.C. supplying the various equipment introduce problems where the rig moves from hole to hole on the platform because of the number of cables needed to supply large amounts of power to these loads. Electric drilling rigs now use locomotive power transmission systems for the draw-works, rotary table, and mud pumps. In this electrical system, the Division of Industrial Safety will recognize that generators, generator power leads, and D.C. motors are automatically protected against overloading by inherent characteristics of compound and differential field windings in the D.C. motor and generator, respectively. No additional overload protection will be required in this case.

The Division of Industrial Safety will recognize the following wiring methods for supplying these loads as providing such freedom from danger as the employment reasonably permits.

Where the offshore platforms are open to the atmosphere and are well ventilated at all times around the drilling operation, the Division of Industrial Safety will require that all wiring and equipment within 50 feet of the casing of the well being drilled either be of the type required for a Class I, Division 2, or be installed in enclosed areas supplied with positive pressure ventilation from a non-hazardous source. Supply to wiring and equipment within pressurized areas shall be arranged to prevent energizing the wiring and apparatus until pressure has been established, and arranged to automatically de-energize the wiring and apparatus when the ventilation fails.

In lieu of the above wiring method, special locomotive cables and other portable cables may be run in cable trays under the following conditions:

1. Open cable trays may be run horizontally under floors or ceilings.
2. In all locations, solid covers shall be installed on horizontal runs where persons or materials may accidentally contact the conductors.
3. Vertical runs of trays shall be totally enclosed.
4. Where the rig moves over a series of holes and a transverse section of cable tray drops trailing cables in a long fixed runway tray, suitable cleats or other means shall be used to secure the cable against shifting in the moving section of tray.

All other wiring and equipment at locations outside the Class I, Division 2 location shall comply with minimum electrical requirements of the Division of Industrial Safety. In particular,

- a. Alternating current conductors shall not be installed in the same raceway or cable tray with the high-voltage direct current conductors where the two systems are supplied from different sources of supply.

- b. Where pneumatic or hydraulic equipment is installed in the same enclosure with live electrical parts, suitable barriers shall be installed between the electrical and non-electrical parts, or the cover of the enclosure shall be mechanically interlocked to prevent opening until live parts inside are disconnected from all sources of supply.
 - c. All live parts on the rear of the control equipment for the D.C. motors shall be enclosed or suitably guarded against accidental contact by persons or material.
 - d. Terminal enclosures shall be installed over live parts on motors to prevent accidental contact by persons or materials.
 - e. Where sheet metal shields or cases are installed over motor terminals or control panels on the drilling floor to shield electrical terminals from accidental contact, a definite supply of purging air shall be introduced by a suitable duct (more substantial than the small rubber hose being used).
 - f. For single-hole setups on shore, acceptable cables may be buried in the earth or run in covered wooden troughs between outdoor units of equipment. A substantial metal or 2-inch wooden cap shall be installed over the trough.
-

Ai-38 EFFECTIVE DATE 6/13/74

Subject:

Low Voltage Lighting

Reference:

Electrical Safety Orders, Article 35

Background:

Recently the Division of Industrial Safety was approached regarding whether a low-voltage lighting installation complied with the intent of Article 35 of the Electrical Safety Orders.

The proposed installation consisted of a 120-volt circuit supplying a 100-volt ampere transformer having an output of 12 volts. The secondary circuit consisted of a two-conductor SPT-2 flexible cord supplying several 18-watt, 12-volt lamps.

Interpretive Decision:

Article 35 is entitled "Remote Control, Low-Energy Power and Signal Circuits." The provisions of this Article are intended to apply to circuits which control any other circuit through, for example, a relay. The Article also includes provisions for circuits which supply energy to a device which gives a recognizable signal. The reference to low-energy power circuits is intended to apply to circuits where electrical energy is used to operate some mechanical device or equipment for a purpose other than to give a signal or open or close a circuit. An example of this type of circuit is an electric door lock release known as a "door opener," though the low-energy power circuit does not actually open the door.

Article 35 is not intended to be used as a substitute for recognized wiring methods contained in Article 5 to supply lighting branch circuits.

Ai-39 EFFECTIVE DATE 6/13/74

Subject:

Mercury Vapor Lighting Fixtures

Reference:

Electrical Safety Order 2465(d)

Background:

Engineers of the Division of Industrial Safety have found proposed installations of mercury vapor lighting fixtures intended for connection to a three-phase three-wire 480-volt distribution system on both indoor and outdoor applications. These installations violate Electrical Safety Order 2465(d).

Interpretive Decision:

Electrical Safety Order 2465(d) limits the voltage to ground on all alternating current branch circuits supplying lampholders or fixtures to not more than 300 volts.

By definition, the voltage to ground in grounded circuits is the voltage between the given conductor and that point or conductor of the circuit which is grounded; in ungrounded circuits, the voltage to ground is the greatest voltage between the given conductor and any other conductor of the circuit.

The voltage to ground in a delta connected three-wire three-phase 480-volt distribution system is 480.

This means that mercury vapor lighting fixtures may not be used on three-wire three-phase 480-volt delta connected distribution systems.

Since mercury vapor lamps are of the electric discharge type, Electrical Safety Order 2430(e) requires these fixtures or lamp installations to be arranged so that they can be disconnected by an externally operable switch or circuit breaker. The switch or circuit breaker shall be located within sight of the fixtures or lamps, or may be located elsewhere if the individual switch or circuit breaker is provided with means for locking in the open position.

Ai-40 EFFECTIVE DATE 6/5/74

Subject:

Overcurrent Protection for Conductors on the Secondary Site of Transformers

Reference:

Electrical Safety Order 2369(c)(3)

Background:

Electrical Safety Order 2369 requires overcurrent protection at the point where a conductor receives its supply. The order also provides for exceptions on feeder taps under certain conditions. When the order was adopted, transformer secondary conductor feeder taps were uncommon; consequently, the order did not explicitly refer to them.

Today, the transformer secondary conductor feeder tap is commonplace, and some installations may be unsafe.

The Division is studying several alternative proposals for control of the transformer feeder taps. Because an immediate problem exists, the Division shall use the short term solution outlined within the interpretive decision.

Interpretive Decision:

Electrical Safety Order 2369(c)(3) may be used in determining allowable lengths of unprotected transformer secondary conductor lengths.

The order allows unprotected conductor lengths up to 25 feet if they:

- 1) Have an ampacity at least one third of the rated transformer secondary current.
- 2) Are protected from physical damage.
- 3) Terminate in a single circuit breaker or fused switch.

Ai-41 EFFECTIVE DATE 6/14/74

Subject:

Temporary Lighting, Flower Growing

Reference:

Electrical Safety Orders

Background:

The Engineering, Education & Research Staff has received inquiries on acceptable wiring practices for temporary lighting of flower growing areas.

Flower blooming can be controlled by the amount of light the plant is exposed to. This technique is used by flower growers to either delay or accelerate plant growth so that blossoming can be regulated for marketing.

The grower installs temporary lighting installations so that these systems can be turned on and off at night, usually automatically by time clocks.

Most of the installations encountered in the field by our engineers have been well below the minimum requirements for safety. These are at variable heights, usually not over 5 feet above the ground. The installations are normally above ground plots which usually are in open fields. They are not inside "hot houses" or "green houses" and are of the open wiring festoon variety.

Interpretive Decision:

The following wiring methods can be used as branch circuit wiring over these flower plots with reasonable safety:

- 1) Type S or equivalent cord with molded lamp sockets; or
- 2) Insul-8 or equivalent multi-conductor aerial cable (all conductors in a common sheath), together with its associated insulated lamp sockets, provided they are suitable for the condition and location used.

All current-carrying conductors in the above cords or cables shall be of the stranded type, at least 12 AWG in size and protected from overcurrent by fuses or circuit breakers set or rated at not to exceed 20 amperes.

All cords or cable wiring where allowed shall be adequately supported or suspended by messengers or other

suitable means and so installed to be protected from physical damage.

The above wiring methods must meet the requirements for outdoor installations, and the installation must provide reasonable safety to persons working about the wiring installations while standing on the ground.

Ai-42 EFFECTIVE DATE 6/14/74

Subject:

Disconnecting Means for Fluorescent Lighting Fixtures

Reference:

Electrical Safety Order 2430(e)

Background:

Electrical Safety Order 2430(e) reads:

"(e) Control. Fixtures or lamp installations shall be arranged to be disconnected either singly or in groups by an externally operable switch or circuit breaker. The switch or circuit breaker shall be located within sight of the fixtures or lamps or may be located elsewhere if the switch or circuit breaker is provided with means for locking in the open position."

Interpretive Decision:

This Order requires all switches and circuit breakers used to disconnect fluorescent lighting fixture installations shall be provided with means for locking the individual switch or circuit breaker in the open position.

Switches used as branch circuit disconnecting means must comply with the requirements of Electrical Safety Order 2430(e). Wall switches used to control these fixtures are not included in this requirement unless they also serve as the branch circuit disconnecting means.

Circuit breakers mounted in a panelboard and used for this purpose must meet the requirements of Electrical Safety Order 2430(e). Locking the panelboard door does not comply with this Order.

A distance of 50 feet shall be considered as equivalent to being out of sight.

Interpretations continued in next issue.

Combustion, Continued

In other words, the oxygen concentration when a candle goes out appears to decrease with increasing altitude.

TABLE IV
Behavior of Candle Flames at High Altitudes As Related to Oxygen Concentrations

Percent oxygen	Atmospheric pressure mmHg	Altitude in feet	Candle
15-----	760	Sea level	No flame
15-----	448	14,000	No flame
15-----	416	16,000	Burns
14-----	760	Sea level	No flame
14-----	470	13,000	Burns
12-----	760	Sea level	No flame
12-----	500	11,500	Burns
12-----	457	13,500	Burns
12-----	406	16,000	Burns
11-----	760	Sea level	No flame
11-----	500	11,500	Burns
11-----	406	16,000	Burns
10-----	760	Sea level	No flame
10-----	562	9,600	No flame
10-----	517	10,500	No flame
10-----	406	16,000	Burns with blue flame

Filling DOT Cylinders by Weight

A Department of Transportation (ICC) cylinder must be inspected first to determine if it is suitable for LP-Gas service. The tare weight and the water capacity must then be established.

1. *Tare Weight.* The tare (empty) weight of the cylinder with valve and without cap must be found stamped on the cylinder or attached collar. It will be noted as "T.W. (weight in pounds)."

2. *Water Capacity.* The water capacity in pounds when filled to 100 percent of capacity at 60° F. must be found stamped on the cylinder or attached collar. It will be noted as "W.C. (weight in pounds)."

3. *Maximum Permitted Filling Capacity (Density).* The maximum weight of propane that may be contained in a suitable LP-Gas cylinder is equal to the weight of .42 of the weight of the water capacity. As examples, 48 pounds W.C. times .42 equals 20 pounds. 239 pounds W.C. times .42 equals 100 pounds.

4. *Scale Adjustment.* Prior to filling a cylinder the scales must be adjusted to indicate the tare weight and the maximum permitted filling capacity (density) of the cylinder. If a double beam scale is used, the poise on one beam may be adjusted for the tare weight and the other poise adjusted for the maximum permitted filling capacity (density). With a single beam scale the total of the two weights must be set on the scale.

As the filling operation progresses, the operator must be ready to close the filling line as soon as the scales balance. After completion of the filling operation, closing valves and disconnecting the filling hose, the total weight of the cylinder and contents should be rechecked to be sure the cylinder is not overfilled.

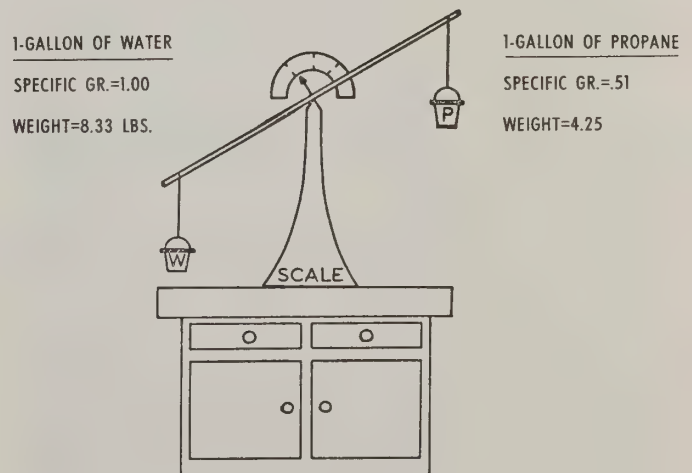


An explosion can result from overfilling.

5. Typical Examples of Weight Calculations.

- Nominal 20 pound propane cylinder
T.W. = 23.5 pounds—W.C. = 48 pounds
Maximum permitted filling capacity =
 $48 \times .42 = 20$
T.W. 23.5 + MPFC 20 = 43.5 pounds total weight
- Nominal 100 pound propane cylinder
T.W. = 72 pounds—W.C. = 239 pounds
Maximum permitted filling capacity =
 $239 \times .42 = 100$
T.W. 72 + MPFC 100 = 172 pounds total weight

Reprinted courtesy of the Western Liquid Gas Association



A LIQUID COMPARISON

A liquid comparison of propane and water.

RADIATION DANGER

Excessive radiation is a relatively new menace to workers. Medical x-rays, radiation therapy, and industrial uses of radiation have become commonplace only within the last 30 years. The State of California has learned to effectively deal with radiation's hazards.

At first, radiation problems were handled by the federal government's Atomic Energy Commission (USAEC). The California State Department of Health assumed the responsibility in the early sixties. It set the standards and regulations for radioactive equipment and material, and delegated to the Division of Industrial Safety the task of enforcing their compliance.

Through its State Radiological Health Unit, the Division of Industrial Safety registers all machines and instruments which contain radioactive material. It licenses industries which use radioactive material and involves itself in special situations concerning radiation. For example:

In a busy urban airport, an airlines employee is unloading radioactive cargo. As he lifts the last container, he notices that one side is badly crushed. Alarmed, he informs his supervisor.

To minimize possible radioactive contamination, the airlines calls an emergency plan into action. The police, fire department, FAA, USAEC, and State Radiological Health Unit are notified. The employee who handled the cargo is sent to a nearby hospital. If the cargo is contaminated, he will have to be detoxified.

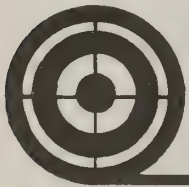
Surface radiation will be removed from his body with water, detergent, or mild acid baths. More extensive medical aid will be made available.

Uniformed officers cordon a large area surrounding the container. The fire department takes a reading from the damaged cargo with an ionization survey meter—a machine similar to a geiger counter. The strength of radiation is expressed in units called roentgens. Because everything emits at least a small amount of radiation, normal background radiation would register approximately .01 milliroentgen per hour. The fire department's reading is interpreted as being 500 milliroentgen per hour, indicating leakage.

In less than an hour, a senior health physicist from the Radiological Health Unit arrives at the scene. He takes a reading with his ionization survey meter. It registers 0.1 milliroentgen per hour; a safe level. The fire department had misread their meter.

Airlines personnel and their union representatives are apprized of the health physicist's findings. The alarm is over.

Radioactive materials or devices have the power to cause tremendous damage if they are misused. Consequently, it is necessary to regulate them efficiently and swiftly. Through the cooperation of the Department of Health and the Division of Industrial Safety, the State has been able to effectively administer safeguards for the use of radiation.



FILM FOCUS

.... on shop floor safety

"Accidents Need Not Happen," a film recently acquired by the Division of Industrial Safety, offers valuable pointers about establishing a safe factory or shop environment. Accidents are attributed to three main causes: negligence, carelessness, ignorance. Safety precautions, the film emphasizes, can minimize the risk and gravity of accidents.

The film demonstrates how loose clothing, jewelry, and long sleeves, if worn near machinery, can catch in a piece of equipment, costing an employee a limb or even his or her life.

The use of guards on machinery, lifting aids such as a block and tackle, and the safe use and maintenance of hand tools are all topics scrutinized by the film.

A valuable asset to any plant safety meeting, the film is available from the Division upon written request without charge. Send requests, including the date or dates the film is needed, to:

Division of Industrial Safety, Staff Services, Rm. 7216
State Building, 455 Golden Gate Avenue, San Francisco, California 94102

START THE YEAR OUT WITH SAFETY!



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Employees Responsibilities to Employers plus . . . Information Employers Must Provide Employees

Your Responsibilities as an Employee

The law charges you, as an employee, with certain responsibilities for your own health and that of your fellow employees (6325, 6326). These responsibilities are:

(a) You must not deface or remove notices posted by the Division to prohibit use of an unsafe machine or to prohibit entry to an unsafe area (6325).

(b) You must obey notices prohibiting the use of unsafe equipment or entry to unsafe areas which are posted by the Division. Failure to obey such a notice or to deface, destroy or remove it without permission from the Division is a misdemeanor punishable by a fine or up to a year in the county jail (6326).

(c) You must not remove, displace, damage, destroy or carry off any safety device, safeguard, notice or warning furnished for use in any place of employment (6406(a)).

(d) You must not interfere with the use of any item, mentioned in (c) above, by any other person (6406(b)).

(e) You must not interfere with the use of any method or process adopted for the protection of any employee including yourself (6406(c)).

(f) You must not fail or neglect to do everything reasonably necessary to protect life, safety and health of employees (6406(d)).

(g) You must comply with all occupational safety and health standards, rules, regulations and orders which are applicable to your actions and conduct on the job (6407).

The Employer's Duty to Provide Information to You

To fulfill their duty of furnishing a safe and healthful workplace, all employers covered by the Act are required to provide certain information to their employees. The information you, the employees, are entitled to includes:

(a) Information regarding protections and obligations of employees under the Occupational Safety and Health Act (6328, 6408(a)). *This information must be posted in the workplace in English and Spanish.*

(b) The *posting of citations* at or near the place of the violation (6408(b)).

(c) The opportunity to *observe monitoring* or measurement of employee exposure to toxic chemicals or harmful physical agents (142.3, 6408(c)).

(d) *Access to accurate records* of employee exposure to potentially toxic materials or harmful physical agents (6408(d)).

(e) *Notification* to any employee who has been or is exposed to excessive (measured against the published standards) toxic materials or harmful physical agents, and notification to that employee of the corrective action being taken (6408(e)).

(f) *Posting of labels* or other forms of warning to ensure that employees are apprised of all hazards to which they are exposed, relevant symptoms, appropriate emergency treatment, and proper precautions (142.3(b)).

(g) *Results of any medical examinations or tests* made at the employer's expense in connection with occupational health/or safety (142.3(c)).

If an employer is not giving you or your authorized representative access to this information, file a written complaint with this division.

*Reprinted Courtesy of
Department of Industrial Relations
University of California, Berkeley, California*

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CAL/OSHA Question Column, Continued

gineer. If the employer thinks the penalties unreasonable, he has the right to appeal to the Occupational Safety and Health Appeals Board. The reasonableness of the date by which violations must be corrected may also be appealed by either an employee or employer.

Aside from these recourses employers and employees have when confronted with an inspection, the Compliance Safety Engineers are professionals. They act within the confines of uniform Division policy. Also, they receive standardized training from the Education and Research Staff. Because of the human element, it is conceivable that two inspections of the same work place on the same day would not achieve exactly the same results. However, inspections are not conducted on the whim of the Compliance Safety Engineer. How he/she feels is not a major consideration in an inspection.

From
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DEPARTMENT OF INDUSTRIAL RELATIONS
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Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5274
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
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Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

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San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	3704 State St. 93105	805-682-2578
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
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Chico	555 Rio Lindo Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
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Ventura	5740 Ralston St. 93003	805-644-8219

Twenty-seven workers lost their lives in aircraft accidents during 1972, down from 47 in 1971, and 50 in 1970. Twenty-five of the employees were involved in crashes, and two pilots died when they walked into moving propeller blades.

"California Work Injuries, 1972"
Division of Labor Statistics & Research

USE NEW RECORD KEEPING FORMS

Each private employer in California should have received a booklet containing CAL/OSHA record keeping guidelines, a log (CAL/OSHA Form 100), and an Annual Summary (CAL/OSHA Form 102) to be used in recording and summarizing occupational injuries and illnesses in 1975. If an employer does not have the booklet or forms, he or she should get in touch with the Division of Labor Statistics and Research to obtain them.

Northern California

Division of Labor Statistics and Research

P.O. Box 603

San Francisco, California 94101

Private employers call: (415) 557-3317

Public agencies call: (415) 557-1088

Southern California

Division of Labor Statistics and Research

3460 Wilshire Boulevard

Los Angeles, California 90010

All employers call: (213) 388-2257

Did You Know? . . .

In 1972, 13 workers were fatally injured when caught in machines or other mechanical devices.

"California Work Injuries, 1972"
Division of Labor Statistics & Research

CAL/OSHA QUESTIONS, PLEASE

Please send questions concerning CAL/OSHA to:

Division of Industrial Safety
Education and Research Unit
455 Golden Gate Ave.
San Francisco, Calif. 94102

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VOL. 58, NO. 6

DECEMBER, 1974

Work Fatalities Involving Scaffolds California, 1970-72



Falls from scaffolds killed 28 California workers during the three years, 1970-72, according to the most recent report in the Work Injuries in California series issued by the Division of Labor Statistics and Research, Department of Industrial Relations. Some fatalities were caused by a single unsafe act or condition, while others resulted from a combination of unsafe factors.

Structural failure of the scaffold—broken ropes, no outriggers, etc.—was the cause of 10 deaths. In addition, 4 workers fell from inadequately guarded scaffolds and 4 did not use a safety belt and lifeline. In 3 cases other unsafe factors existed, and in 7 fatalities the details of the accident were not available for analysis.

Structural failure of scaffold—10 deaths

A painter was painting smoke stacks at an oil refinery from a boatswain's chair supported by $\frac{1}{2}$ " Manila rope. The rope broke about 15' below the attachment at the top of the stack and the worker fell 165' to his death. Examination of the rope indicated that the rope was old and defective. Ropes should be inspected at regular intervals for wear and replaced every six months regardless of appearance. California Safety Orders require that a separate $\frac{3}{8}$ " lifeline and safety belt be used by employees working in a boatswain's chair.

Two window washers were riding a suspended stage powered by two electric hoisting machines to the top of a high-rise apartment house. When they reached the 25th floor they stopped briefly, then resumed the operation of the hoist. At this point, the suspension cable on one end of the scaffold failed and the end swung down. One of the workers plummeted 25 stories and was killed when he struck the pavement. The other worker managed to grab a handhold on one of the hoisting units, then swung onto a balcony. Analysis of the hoist machine and cable after the accident revealed that both were worn. The two workers, both experienced high level window cleaners, were not using safety belts, although belts were

available at the jobsite, and California Safety Orders require that they be used when working from suspended stages.

A construction laborer was standing on a rolling scaffold stripping plywood decking from the first floor of a building under construction. He stayed on as the scaffold was pushed to a new work station. As the scaffold was being moved, one of the small casters on which the framework rested fell out and the scaffold overturned. The worker fell 10' to the ground and sustained fatal head injuries. State safety regulations require that a rolling scaffold be equipped with (1) casters of adequate size and (2) an effective locking device that shall be kept locked when workers are climbing or working on the scaffold. Also, these scaffolds shall be operated on floors or surfaces free of holes, pits, or obstructions.

A maintenance man was installing fluorescent lighting fixtures on a 22' high ceiling with the help of two brothers 14 and 15 years old. A portable metal scaffold, three

(Continued on page 2, col. 1)



Richard Wilkins

CHIEFLY SPEAKING

CAL/OSHA provides a service to employers, employees, and labor organizations throughout the State by requiring workplaces to be safe. However, the overwhelmingly positive and constructive aspects of the program are frequently overshadowed by misunderstandings concerning its format of operation.

Its purpose is not to punish employers by levying fines. The penalty system adds an incentive for making work-

(Continued on page 3)

(Fatalities, continued)

sections high, was being used. Crossbracing was in place, but there were no lock pins or equivalent means to secure any of the joints, including the wheel or caster joints. When the portable scaffold was to be moved to the next position, the 14-year-old brought a forklift up to move the scaffold. The maintenance man stayed on the top level of the scaffold platform during the move. Using the forklift, the scaffold was raised. The forks were not as wide as the 5' width of the scaffold so the minimum dimension of the scaffold base was considerably reduced. The scaffold began to tilt and a wheel came loose from one corner post. The maintenance worker shifted his weight to compensate and then began to climb down. The scaffold continued to tip and dumped the employee 15' to the concrete floor below. He suffered fatal head injuries.

A high school janitor was painting the enclosure wall of a patio. He was working from a 30" wide rolling scaffold with the scaffold plank 48" high, and was using a paint roller with a 6' handle. When the employee bent over to put his roller into the paint tray, his buttocks pushed against the wall, causing the scaffold to tip away from the wall. He fell head first to the concrete patio and sustained a fatal skull fracture. The scaffold should have been equipped with outriggers to prevent it from tilting.

A painter was painting a three-story store front, 50' high by 100' long. After completing the next to the last pass from top to bottom on the swing stage, the worker went up to the roof section to reset the painter's falls for the last 15' wide pass down the wall. He had reset the hooks over the 32" bond beam and the two workers below pulled the falls into position. The painter climbed over the bond beam onto the scaffold and jumped up and down on the platform to test the strength of the falls. The two pieces of ¾" blocking between the parapet hook and bond beam fell out, allowing the hooks to rotate and the scaffold to fall to the concrete sidewalk below. The painter sustained fatal head and chest injuries. The falls had been attached to the hooks with 4" rings welded to the short side of the hooks, but there were no rings on the back of the hooks for tie-down purposes as required by California Safety Orders.

Lack of safety belt and lifeline—4 deaths

A painter was fatally injured when he fell about 45' while painting a storage tank at an oil refinery. The painting was to be done from a boatswain's chair rigged to the top of the tank. A safety line was attached to the tank independently of the chair rigging, and the painter was wearing a safety belt. The painter used the permanent ladder attached to the tank to reach the chair. In pulling the chair toward the ladder, the hook attachment which supported the boatswain's chair twisted so that the weight of the chair rested on the metal wire ("mouse") used to close the open part of the hook. When the painter placed his weight on the chair the wire (which was intended only to prevent accidental slipping out of the hook) was unable to sustain the load and broke. The painter had not attached the lanyard of his

safety belt to the available safety line and fell with the boatswain's chair. In order to prevent this type of accident, workers should tie off to safety lines *before* entering suspended work platforms.

A boilermaker was building a steel bracket-type catwalk scaffold on the roof of a chemical plant. Steel I-beams, spaced 10 to 12 feet apart, had been installed as supports for a 4' diameter conveyor pipe on the roof of the building and extended, at right angles to the pipe, far enough to support a single plank work platform. While moving a plank the worker lost his balance and fell 12' to the ground, suffering fatal head injuries. Guarding was not necessary on the side protected by the pipe and would have been difficult to put into place on the other side before the scaffold platform had been completed. However, numerous tie-off places were available at the jobsite and use of a safety belt and lifeline could have prevented the fatality.

Inadequately guarded scaffold—4 deaths

Three workers were installing a sign above the doors of the lubrication room at a service station. The men were working from a scaffold which was mounted on a pickup truck, and the scaffold platform was 8' above the bed of the pickup. A painter was placing letters on the sign when he fell head first off the scaffold to the pavement below, and suffered fatal head injuries. Apparently the worker lost his balance while reaching toward the sign. The scaffold should have been equipped with guardrails mounted 42 to 45 inches above the work platform.

A sheet metal worker and his helper were installing air conditioning ducts on the ceiling of the second floor of a high school library building under construction. They had finished the duct installation in one room and before starting on the next, a section of duct had to be installed through an opening in the wall. On one side of the wall there was a large floor opening that dropped 22 feet to the basement. To install the duct, it was necessary to work from a scaffold spanning the floor opening. The floor sections surrounding the opening formed a split-level so that one edge of the opening where the scaffold was to be erected was six feet higher than the other. The two employees built a scaffold with two 2" x 10" x 14' planks, one on top of the other. One end rested on a stepladder, approximately 6 feet above the level of the lower edge of the floor opening. The platform was nearly horizontal and was placed about 12 inches from the wall through which the duct was to be extended. The sheet metal worker climbed onto the scaffold and secured the duct with a metal strap. When he had finished the job, he lost his balance and fell through the narrow opening 28 feet to the concrete floor, sustaining fatal head injuries. No guardrail or safety belt protective measures were employed to prevent this fatal fall.

Material in this article was assembled by the staff of the Division of Labor Statistics and Research, Department of Industrial Relations.

(Chiefly Speaking, continued)

places safe. Employers are given every opportunity to achieve voluntary compliance. They may contact the Consultant Staff of the Division of Industrial Safety for advice on specific safety problems. The Division will help them initiate safety programs, provide safety experts to speak to groups, and offer films pertinent to safety. The Consultants do not issue citations for violations they encounter in their field visits—they simply instruct the employer on ways of correcting them. The Safety Orders should not hold many surprises for a safety conscious employer. Most have been part of the California Administrative Code for years.

Civil penalties are assessed by District Managers of the Division from reports given to them by Compliance Engineers. The penalty amount is adjusted in order to favor the employer who has a safe history, a good safety program, or a small business with less ability to absorb an additional financial burden.

Nonserious violations have the potential to be reduced as much as 100% from the original amount. In other words, penalties are sometimes never levied for nonserious violations. Fifty percent of the amount of serious violations may possibly be reduced through various adjustments. For detail on how the penalties are assessed, a pamphlet is available upon request from the Division entitled, "CAL/OSHA Assessment of Civil Penalties." Fines are usually not high if an employer is cooperative and, by past action, has demonstrated a concern for safety.

CAL/OSHA is designed so that the Compliance Officer is not the last word in judging a condition safe or unsafe. The employer, an employee, or an employee's representative may appeal to the Division District Manager and/or the California Occupational Safety and Health Appeals Board if the abatement date for a violation is felt to be unfair. The employer may appeal the justice of a citation, and/or the penalty to the California Occupational Safety and Health Appeals Board as well.

Safe work places are directly beneficial to employees and employee organizations. Staying whole and healthy is paramount to most workers. CAL/OSHA directly deals with meeting this safety challenge.

The employer receives innumerable indirect benefits. An effective safety program reduces business costs. Fewer accidents mean fewer lost production hours. The safe way is often the most efficient way in the long run. The premium for workers' compensation insurance may become lower or rise less swiftly. Court costs and lawyers are not required as often. For all these reasons, CAL/OSHA works for the benefit of everyone under its jurisdiction. It is important for people to look closely at the program in order to fully understand its positive value.

If You Move—

notify us of your new address and send us yellow address label or copy of it as it appeared on last issue.

Question: 1. At what stage of job completion are hard hats not required to be worn?

Answer: They are not required when there is no longer any danger from objects falling or flying, or a hazard from working near low-hanging equipment or objects.

Question: 2. Are we required to wear hard hats when there is little or no hazard from above?

Answer: If there exists *any* hazard from above, hard hats are required. If there is **NO** hazard from above or from flying objects hard hats are not required; although they are required when riding a motorcycle (M.V.C.) and required of all maintenance employees, inspectors, flagmen, and surveyors of D.D.T. When working near traffic. It is also common practice with many contractors to have all their personnel wear hard hats when on construction sites.

Question: 3. When are toeboards required on scaffolds?

Answer: They are required when the scaffolds are expected to have tools or other loose materials placed or used upon them and the platform is 7½ feet or more above grade.

Question: 4. Does a Trenching Permit cover a single excavation or may it be issued for one job with a number of excavations executed over a long period of time; for example—6 months?

Answer: It may be issued for one job with a number of excavations executed over a long period of time.

Question: 5. Do I have to get a trenching permit if I have to do an emergency repair?

Answer: No.

Question: 6. Do roof eye bolt supports have to be approved by the Division of Industrial Safety for use on suspended scaffold installations?

Answer: They are required to be capable of supporting a load of 5,400 lbs. dead weight.

Question: 7. Are permits required for trenches if a permit is granted from a governmental agency?

Answer: Yes, with one exception. When a maintenance or performance crew (employees) of a governmental agency does its own work, a permit is not required from the Division. If the work is done by others for the agency, a permit from the Division is required, except in emergencies.

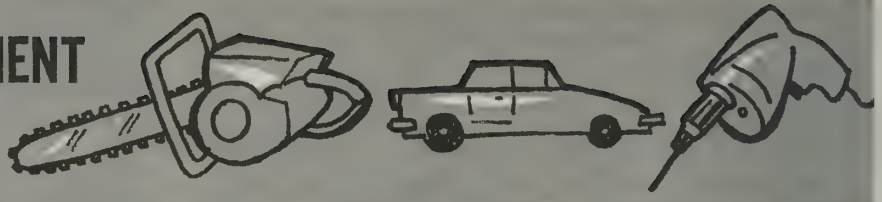
DID YOU KNOW?

Nine workers died when they breathed in an atmosphere filled with poisonous gasses or vapors.

"California Work Injuries, 1972"

Division of Labor Statistics & Research

POLICY IN THE EQUIPMENT RENTAL INDUSTRY



The rental equipment industry, unlike many other industries, is not regulated primarily by government agencies. Its safety policies and ethical conduct are largely self-policed. If the industry expects to avoid government controls, it must demonstrate that it can responsibly determine its own conduct.

The rental of motor vehicles is one area restricted by law. The State Department of Motor Vehicles restricts rentals by Vehicle Code 14608 and Vehicle Code 14609.

14608. Rental of Vehicles

No person shall rent a motor vehicle to another unless:

(a) The person to whom the vehicle is rented is licensed under this code or is a nonresident who is licensed under the laws of the state or country of his residence.

(b) The person renting to another person has inspected the driver's license of the person to whom the vehicle is to be rented and compared the signature thereon with the signature of such person written in his presence.

14609. Records of Rentals

Every person renting a motor vehicle to another person shall keep a record of the registration number of the motor vehicle rented, the name, address, and license number of the person to whom the vehicle is rented, and the date and place, when and where the license was issued.

Rental equipment dealers have good reason to regulate themselves. The equipment which they rent represents a substantial capital investment. There is a saying, "Rent equipment as carefully as you would loan money."

For the protection of the dealer, the customer, and the equipment, the dealer should not rent to a customer if it appears that the customer cannot handle a piece of equipment. An inexperienced person is more likely to have an accident. The dealer might have to go to court if an accident occurs with his equipment. It is always expensive to go to court because time costs money—even if there are no legal fees or settlements. To avoid renting to people who are likely to have accidents is sound judgment on the dealer's part. When in doubt, the dealer should make the customer demonstrate his ability to use the equipment.

With each piece of equipment, a set of instructions should be included. The customer should be warned of any peculiarities of the machine. When feasible, hazards on the equipment should be marked by a label in bright red declaring, for example, "DANGER—DO NOT IMMERSE IN WATER!" or "DANGER—HIGH VOLTAGE!" If a dealer expects his equipment to be returned in good order without being involved in an

accident, the customer must use it properly. Thorough instruction is a must.

As an example of what can happen if the person to whom equipment is rented is not properly instructed as to its use:

A long time customer of an equipment rental dealer rented a post hole digger. The auger on the digger exerted enough force to require that it be operated by two men. The dealer assumed that his customer knew this fact.

While the customer was operating the digger alone, the auger hit a rock. The force of the spinning auger twisted the man around and wrenched off the auger. The man sustained back injuries.

The machine was inoperable for a week. During that time the equipment rental dealer lost the revenue he would have made if the equipment had been rented. The dealer paid the repair bill in the end. All around, it was an unpleasant incident.

In the following example, the equipment rental dealer was called upon to judge the ability of a customer to operate a machine.

Late one afternoon a man entered the shop of an equipment rental dealer and inquired about renting a chain saw. The dealer watched him walk unsteadily around the shop. At close range the man smelled unquestionably of alcohol. Thinking of the expensive saw and the danger of the powerful blades, the dealer decided not to rent to the man and told the customer that he couldn't have the saw and why.

The customer became indignant, stomped out the door, got into his car, put it in reverse, stepped on the gas, and smashed into a street light. The trunk of his car looked like an accordion—that same trunk which would have held the dealer's saw, had the customer been allowed to rent it.

Equipment should be thoroughly serviced before it is rented. The dealer should make certain that the equipment has the appropriate safeguards in working order. Lack of proper servicing and safeguards are among the prime causes of accidents. Usually a dealer is not liable if someone has an accident while using his equipment. If the equipment is faulty at the time it is rented, the dealer often becomes liable.

In order to insure that the equipment is in good order, a checklist should be completed and signed by the maintenance man or dealer. It is also a good idea to have the customer sign the checklist—vouching that the items on the list appear to be in good working order. Another checklist should be completed when the equipment is returned—noting any damage. These two checklists help

(Continued on page 5)

(Policy, continued)

prevent a dealer from having to pay the repair bill for damage done to a piece of equipment which the customer claims was "already there."

If a piece of equipment causes maintenance or safety problems because of some fault in design, the dealer should tell the manufacturer about it. Manufacturers are in the business of making what pleases and thus what sells. If they think they can sell more of a product by modifying the design, they will change it.

As an example, it is reputed that the current reduction in weight of chain saws came about because of a complaint from an equipment rental business. The rental company said that the saws were too heavy and people were injuring themselves while lifting them. Also, maintenance was a problem. The saws were being handled roughly because of their awkward size. The rental company stopped ordering from the saw manufacturer. Shortly thereafter, the manufacturer introduced a much lighter saw. The weight of chain saws has continued to decline ever since that time.

The companies who insure the equipment rental businesses for liability and damage recommend that certain practices be followed. They recommend that rental contracts contain a hold harmless agreement. It states that the person to whom a piece of equipment is rented will not hold the rental dealer liable if he or she is injured while using the rented equipment. Remember, though, if the equipment was in disrepair at the time it was rented, a court of law might find the rental dealer liable.

The dealer should keep accurate records of his equipment—to whom it was rented, the dates, and the customer's identification. Accurate records help trace equipment which is not returned.

Equipment rental dealers should not rent to anyone under the age of 18. Individuals younger than 18 are not responsible for their debts.

Running a safe business is simply sound business sense. Accidents are expensive. They frequently render equipment inoperable, often cause court appearances, sometimes result in paying a settlement or court fees, raise insurance rates, and injure one's business reputation. For all these reasons it is important for the equipment rental dealer to make safety a number one consideration.



Free CAL/OSHA Public Workshops

In order for employers and employees to prepare for CAL/OSHA inspection and to encourage voluntary compliance with the state safety orders the DIS is sponsoring a series of public workshops. Two workshops will be held in January 1975 and two in February.

These workshops are free and are conducted by the consultation staff of the DIS.

They will run about a half day, four hours or longer and ample time will be allowed for questions and answers.

The subjects will be modified to suit the particular needs of the region in which the workshops are held.

Workshops will be offered every month, to August 1975 and exact dates and time will be announced later for those starting in March.

The forthcoming ones scheduled are:

January 15, 9 am to 12:30 pm—Santa Ana City Hall, 20 Civic Center Plaza, City Council Chambers. Topic: Construction Safety Orders—Cranes & Derricks.

January 16, 9:30 am to 12:30 pm—In Redding, Holiday Inn, Pioneer Room A, 1900 Hilltop Drive. Topic: Employee-Employer Rights Under CAL/OSHA.

February 12, 9 am to 12:30 pm—Eureka, College of the Redwoods, the Forum Auditorium. Topic: Logging & Sawmill Safety Orders.

February 21, 9 am to 12:30 pm—Encino, Naval Reserve Training Center, Auditorium, Corner of Victory & Balboa Blvd. Topic: Construction Safety Orders and General Industry Safety Orders.

CALIFORNIA SAFETY NEWS

Vol. 58, No. 6

December, 1974

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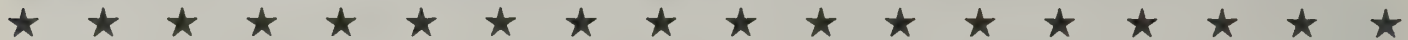
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What An Employee Should Do When His/Her Workplace Is Unsafe



Reprinted from "Rights and Responsibilities of Employees Under CAL/OSHA" by Fred Ottoboni, Anne Trebilcock, and Shirley Woo with permission from the Center for Labor Research and Education, Institute of Industrial Relations, University of California, Berkeley.



Inspection Resulting From an Employee Complaint

California's Occupational Safety and Health Act gives you the right as an employee to bring a CAL/OSHA inspector to your job by making an official complaint directly to the Division of Industrial Safety. You do not have to talk to anyone before making the complaint, and the Division by law must not reveal your name to anyone if you tell the Division that you wish to remain anonymous (6309). In some situations, however, speaking to a supervisor or a union representative may solve the problem. Employers who are interested in the health and safety of employees will voluntarily correct problems without any need for intervention by CAL/OSHA inspectors. In addition, unions are becoming more and more concerned with health and safety and are changing their contracts with employers to provide procedures for better resolution of job health and safety problems. Unions also have the right to use the complaint procedure to bring CAL/OSHA inspectors to places of employment within their jurisdictions. Thus, the employee has several alternatives when faced with a particular health or safety problem and should use the approach which fits his/her circumstances best.

Filing a Complaint

Filing a complaint about a job safety or health problem is simple. Just write a letter or send a filled out complaint form to the Division of Industrial Safety's regional office nearest you. If the situation is so bad that someone is

likely to be injured or killed before you can write a letter or fill out a form, immediately telephone the nearest office of the Division of Industrial Safety. The addresses and phone numbers of these offices throughout California are listed on page 8. If you do telephone the Division regarding a job hazard, you should follow up the phone call with a brief complaint letter or form so that your complaint is documented in writing. The written complaint *IS* important, because it can be used to protect you against retaliation. It also assures that you will be kept informed of the Division's findings.

The letter you write or the complaint form that you fill out should contain sufficient detail to enable the Division to determine that the situation calls for an inspection. But, you are not expected to be an expert, so state the problem in your own words without exaggerating the condition as there are penalties for knowing falsification (6426).

The Importance of a Written Complaint

Remember, there is nothing special about a complaint form—it's just an easy way for you to get the necessary facts on a piece of paper. So if you can't get a blank complaint form, write a complaint letter to the Division. You do not have to be an expert in safety or health to write a complaint letter. Use your own words to describe the problem or problems.

You can also telephone a complaint to the Division. Telephoned complaints, however, are not recommended except in emergencies for the following reasons:

1. You should have a written record of the complaint, particularly if you represent other employees.
2. Without a written complaint in their files, the Division will not be able to keep you informed of the results of their inspection.
3. If your employer discriminates against you for filing a complaint, a written record will help the Labor Commissioner to protect you. If there is no record that you complained, it might be difficult for you to show that your discrimination problem was the result of a job safety complaint.
4. If the employer fails to correct the unsafe condition and someone is subsequently injured, the written record may be valuable in assuring the victim proper compensation.

If you telephone the Division, be sure to: (1) follow the phone call with a confirming complaint or letter and (2) keep a copy for your file.

What Happens After the Complaint is Filed

Within three days from the Division's receipt of your complaint, they must respond (6309). Either an inspector
(Continued on page 7)

(Unsafe Workplace, continued)

will visit the workplace with no advance warning, or you will receive a letter explaining that your complaint does not have a reasonable basis for requiring an inspection. Or, the Division may decline to inspect because they determined that you filed the complaint for harassment purposes only. In any event, if there is no inspection, you must be given reasons in writing by the Division (6309).

Information Provided to the Person Who Complains

The Division is charged by law with keeping accurate records of all complaints, verbal or written (6309). This section of the law also provides that the complainant shall be informed of any action taken in regard to the complaint and the reasons for such actions.

If you complain to the Division about an unsafe or unhealthy work situation, you should receive a written reply as to the action taken (or not taken) by the Division.

CAL/OSHA says that any employee may refuse to work in a situation where official safety or health standards are violated, if such a violation creates a real and apparent hazard to the employee or his fellow employees (6311). In other words, under California law, employees may refuse to work on jobs where such work would clearly expose them or their workmates to extreme danger to life or limb. In these cases, the employer is forbidden from laying off or otherwise discriminating against employees who refuse to work (6311).

It is important to recognize that refusal to work is an unusual remedy that should only be used when actually necessary. Additionally, the law is new and untested in this area and refusal to work where the danger is not clear could result in layoffs or loss of wages. Therefore, if you must use this section of the law to protect yourself, inform your supervisor and immediately call the nearest office of the State Division of Industrial Safety (a list of telephone numbers is included in the back of this newsletter). Also, contact your union, take photographs if possible, note the names of witnesses and send follow-up letters to confirm your telephone calls to the Division of Industrial Safety and others.

If you are laid off or discharged for refusal to work as described here, CAL/OSHA can protect you against such action, but only if you act within 10 days of the alleged discriminatory action. Within 10 days you must notify your employer that you intend to file a complaint with the State Labor Commissioner. Then within 30 days of the discriminatory action, you must actually file the complaint with the Labor Commissioner. Upon receiving your complaint, the Division of Labor Law Enforcement must investigate. If Sections 6310 or 6311 of the California Act have been violated, the Division of Labor Law Enforcement must bring appropriate court action at no cost to the employee to bring about rehiring or reinstatement of the employee to his former position with back pay (6312).

Additionally, your union will be able to help you cope with these problems by assisting with filing complaints representing you as provided in their labor-management agreement.

Safety Hazards

A safety hazard can be defined as a situation in which you or your fellow employees may be injured or killed. Some examples of common safety hazards are faulty electrical wiring, platforms with no railings, unguarded gears, belts and pulleys, careless use of flammable solvents, power grinding without eye protection, and countless other job situations where people may be electrocuted, burned, cut, crushed, blinded, or otherwise hurt. Safety standards prescribe job conditions designed to prevent these accidents. While you should be familiar with the safety standards for your job, you should not worry about being a safety expert. If you feel that safety standards are being violated or that your job is somehow unsafe, you should discuss the problem with your supervisor and/or union representative or file a complaint. Your responsibility is to make your questions known so that experts representing your employer, your union, or CAL/OSHA can decide if there is a problem.

Health Hazards

A health hazard is usually more complicated than a safety hazard, but can be defined as a job situation where you or your fellow employees can be poisoned or made sick by chemicals or other harmful agents such as heat, noise, x-rays, microwaves, dust, fumes or gasses. Examples of some job-caused illnesses are headaches from automobile exhaust, skin rashes from use of solvents, lung disease from inhalation of dust, hearing loss from loud noise, eye damage from arc welding, and cancer from contact with certain chemicals. Job health hazards are more difficult to evaluate than safety problems. Therefore, do not hesitate to ask for help. CAL/OSHA includes health standards designed to protect worker health, so if you or your fellow employees feel that something on your job is damaging your health, talk to your supervisor and/or union representative, or file a complaint.

In November, each private employer in California should have been sent a booklet containing CAL/OSHA record-keeping guidelines, a log (CAL/OSHA Form 100), and an Annual Summary (CAL/OSHA Form 102) to be used in recording and summarizing occupational injuries and illnesses in 1975. If an employer has failed to receive the booklet and forms before the end of this year, he should get in touch with the Division of Labor Statistics and Research to obtain them.

Northern California

Division of Labor Statistics and Research

P.O. Box 603

San Francisco, California 94101

Private employers call: (415) 557-3317

Public agencies call: (415) 557-1088

Southern California

Division of Labor Statistics and Research

3460 Wilshire Boulevard

Los Angeles, California 90010

All employers call: (213) 388-2257

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Filler Hose Adaptors (Safety Checks)

The use of a "Filler Hose Adaptor" on the end of a tank truck filler hose is considered a necessity by many operators. This device, which connects between the end of the hose coupling and the filler valve inlet, includes a positive back check and a vent valve assembly. When used regularly, the device offers the following advantages:

1. In case the filler valve fails to close properly, a positive back check valve is available to close the tank connection.
2. The end of the filler hose can be disconnected from the "filler hose adaptor" freeing the filler hose for further use. The filler valve cap can then be secured to the end of the "filler hose adaptor" and the filler valve can be repaired or replaced when convenient.
3. The inclusion of the vent valve assembly, which bleeds the volume between the filler valve inlet and the positive back check within the "filler hose adaptor" provides a positive means of determining the filler valve has properly closed before attempting to disengage from the filler valve.

A "filler hose adaptor", like many safety devices, must be used constantly in order to reap the benefits of such a device. A second unit should always be carried in the glove compartment of a delivery unit so that when the occasion arises that the unit on the filler hose is left installed on a container a replacement unit is immediately available. These devices have been used over many years, therefore, they are time-tested and proven.

Reprinted courtesy of the Western Liquid Gas Association.

CAL/OSHA QUESTIONS, PLEASE

Please send questions concerning CAL/OSHA to:

Division of Industrial Safety
Education and Research Unit
455 Golden Gate Ave.
San Francisco, Calif. 94102

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5274
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
Panorama City	8155 Van Nuys Blvd. 91402	213-988-6141
Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

District Offices

Bakersfield	225A Chester Ave. 93301	805-324-6437
Concord	1070 Concord Ave. 94520	415-676-5333
El Monte	3415 Fletcher Ave. 91731	213-572-6960
Fresno	2550 Mariposa St. 93721	209-488-5302
Long Beach	230 E. Fourth St. 90802	213-432-8443
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-3861
Modesto	1800 Coffee Rd. 95355	209-529-7751
Oakland	1111 Jackson St. 94607	415-464-0660
Panorama City	8155 Van Nuys Blvd. 91402	213-782-1800
Redding	1421 Court St. 96001	916-246-1621
Sacramento	2422 Arden Way 95825	916-445-5818
Salinas	21 W. Laurel Dr. 93901	408-449-7235
San Bernardino	303 W. Third St. 92401	714-383-4321
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	3704 State St. 93105	805-682-2578
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
Vernon	2833 Leonis Blvd. 90058	213-589-5848

Field Offices

Chico	555 Rio Lindo Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
Ukiah	264 E. Smith St. 95482	707-462-8850
Ventura	5740 Ralston St. 93003	805-644-8219

Explosions caused 27 employee deaths in 1972, far below the 51 recorded in 1971. Ten of the workers died as a result of using cutting torches or welding tools too close to flammable solutions or gases. Three workers lost their lives in a single tragic explosion and two in another.

"California Work Injuries, 1972"

Division of Labor Statistics & Research



California Safety News

Vol. 58, No. 5

NOVEMBER 1974

FREE CAL/OSHA PUBLIC WORKSHOPS

Safety standards for general industry will be the topic at two November workshops. In September of this year 24 public workshops in 17 California communities were started and will continue through August 1975. Twelve will be offered in the northern part of California and 12 in the southern area.

The 5th in the series will be held November 14, 1974 in Lancaster—Exposition Hall, Fairgrounds, 50th Agricultural District, Avenue "1" and Division Street. The 6th will be held November 26 in San Francisco—State Building, 455 Golden Gate Ave., Room 1194. The Lancaster workshop will run from 9:30 a.m. to Noon and the San Francisco one from 8:30 a.m. to 12:30 p.m.

Richard Wilkins, Chief of the Division of Industrial Safety, says that the workshops will explain in detail job safety standards required by California Safety Orders. At each session one of these topics will be discussed:

- General Industry Safety Orders—Machine Guarding
- General Industry Safety Orders—Agriculture
- Construction Safety Orders—Mobile Equipment
- Construction Safety Orders—Cranes—Derricks
- Electrical Safety Orders
- Trenching—Demolition and Scaffolding Permits and Requirements

Logging and Sawmill Safety Orders Employee and Employer Rights under CAL/OSHA

These and other subjects will be modified to meet the particular needs of a region. The workshops will run for approximately four hours with adequate time for questions and answers. They will deal with specific Safety Orders and will not be an overview of AB-150 and CAL/OSHA. They will be conducted by the Division's Consultants to explain in detail California Safety Orders. The General Industry workshop topics will include, but are not limited to:

- point of operation guarding—power press; general and metal working machines; woodworking, food, rubber, plastic and miscellaneous machines;
- guarding standards for prime movers, shafting, pulleys, belt drives, gears, chains and machine controls.

Workshops are planned for Eureka, Fresno, Los Angeles, Modesto, Oakland, Panorama City, San Diego, San Francisco, San Jose, Sacramento, Redding, Santa Ana, San Bernardino, Santa Barbara and Visalia-Tulare.

Information on dates, locations and topics for these workshops will appear in future issues of the California Safety News, or they may be obtained from your nearest Division of Industrial Safety office.



CHIEFLY SPEAKING

Richard Wilkins

As most people know by now, California employers are responsible for maintaining a safe and healthy work environment for employees. They are subject to civil penalties if violations of Safety Orders of the Division of Industrial Safety are discovered on the work premises.

Renewing plant equipment and machinery can be one way to attain compliance with the Safety Orders. However, employers should be careful that their new pur-

chases conform with the specifications of the Safety Orders and do not create hazards and violations of their own. After all, the employer, not the manufacturer, will be paying any penalties. The employer cannot pass his responsibility for maintaining a safe environment to the manufacturer or to anyone.

The employer may take steps to assure himself that a piece of equipment meets the standards of the Safety Orders. First, he should require that purchase orders of contracts or services carry specific language guaranteeing that the purchased item conforms with all safety and health orders of the State of California. Manufacturers are not required by law to make their products comply with California's safety and health standards. Overseas and out-of-state manufacturers are, perhaps, the least likely to feel compelled to meet our standards. Therefore,

(Continued on page 2, col. 1)

let the buyer beware. A written guarantee offers the purchaser greater assurance that new equipment and machinery does comply. Leased or rented equipment and machinery should also be covered by an agreement guaranteeing that it complies with the Safety Orders.

Second, the employer may request that a Consulting Engineer of the Division of Industrial Safety look at a specific piece of equipment or machinery and evaluate its safety. The Consultant is an expert in the industrial safety field and will be able to explain to the best of his knowledge what is necessary to bring an item into compliance. The Consultant cannot guarantee that a piece of equipment, device, or place of employment is in compliance. He can only offer an opinion based upon his experience and knowledge.

If the Consultant should overlook a violation, conceivably a Compliance Engineer could cite the employer. However, the visit of a Consultant can eliminate many violations. The fact that an employer calls a Consultant demonstrates his desire to maintain a safe work place. That fact would be considered in evaluating the employers' good faith if a Compliance Engineer were to issue a citation. It would probably cause the penalty to be modified.

Helping employees understand and implement the minimum standards for safety and health in force in California is part of the Division's responsibility, but the Division cannot go beyond that and offer out-and-out safety approval of products and work places. For that reason employers should explore every avenue available in assuring themselves that new purchases comply with the Safety Orders.

CALIFORNIA SAFETY NEWS

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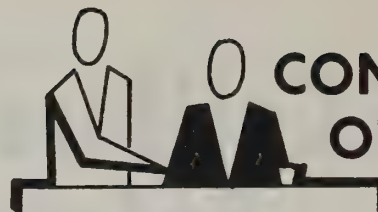
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CONSULTANTS ON THE JOB

The Consulting Engineers of the Division of Industrial Safety have advised hundreds of Californians on various aspects of safety. Below are a few of the many letters the Division has received in response to their activities.

Through the courtesy of your office, we had the pleasure of having a Consulting Safety Engineer address our class.

I am instructing a class in Techniques of Foremanship, jointly sponsored by the Industrial Contractors Association and the Plumbers Union Local 467. The Consulting Safety Engineer spoke to our group about the role of the safety engineer and the continuing and ever increasing need for safety. His presentation was hard hitting and informative. He fielded questions thoroughly and generated some excellent discussion.

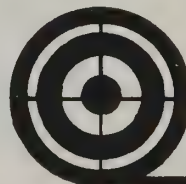
The members of our class, all working plumber foremen, have a much better appreciation of safety and the efforts of your organization as a result of his presentation. The journeyman and apprentices working for these foremen will also be more safety conscious.

Please accept our appreciation and convey our thanks to Mac for an interesting and informative presentation.

Marlin Keats

On behalf of Lyle Wescoatt, Equipment Branch Safety Coordinator and the Department of Transportation's Safety Coordinators, I would like to express my appreciation for the assistance you gave us during the consulting visit to our Sacramento Equipment facility. All of us learned a great deal from your visit and I am sure that the safety conditions in our facilities will be materially improved as a result of your visit.

(Continued on page 8)



FILM FOCUS on shortcuts

"Take Time to be Safe," a film produced by the National Safety Council, is an excellent illustration of the old proverb, "Haste trips its own heels." Points such as taking the time to clear a path before moving materials, not carrying too much at once, using tools for the purpose they were intended, and not taking detours through hazardous areas to save time are covered in various segments.

The movie has been recently acquired by the Division of Industrial Safety. It is available to the public upon written request without charge.

NEW RESPIRATORY EQUIPMENT STANDARDS BECOME EFFECTIVE

New safety standards for respiratory equipment were approved by the Occupational Safety and Health Standards Board on June 25, 1974 and became effective in early August. The old Section 5144 of the General Industry Safety Orders was repealed and a new Section 5144 was adopted. Substantial changes involve a general tightening of the procedures to be used with respiratory equipment.

Requirements for the approval of respirators have been made more precise. Respirators must be approved by the U.S. Bureau of Mines or the National Institute for Occupational Safety and Health as safe under the conditions for which they will be used. The employer is required to provide employees working in toxic environments with respirators. Replacement parts must be approved for the specific respirator. If a piece of respiratory equipment has not been approved by the U.S. Bureau of Mines or the National Institute for Occupational Safety and Health, its use is contingent upon the approval of the Division of Industrial Safety.

The education of the employees who use respirators has greater emphasis in the newly adopted Section 5144. Employees must be trained by a qualified person in the use and care of respiratory equipment which they may have occasion to use. They must be taught the limitations of the equipment as well as how to determine when it must be worn. Training includes instruction on fitting and testing the respirator. The operating instructions governing the selection and use of respirators must be written.

The employer's responsibility for keeping respiratory equipment in good working order and sanitary condition is stated more explicitly in Section 5144. Emergency equipment must be inspected by a qualified individual at least monthly and a record of the most recent inspection is to be posted on the respirator.

Frequently used respirators must be cleaned, inspected, and sanitized by a qualified individual with each use and before being passed for use from one person to another. When not in use, respirators must be stored to protect against dust, sunlight, extreme temperature, excessive moisture, or damaging chemicals.

Requirements for the quality of the air used with



Ultra filter respirator with ultravue facepiece.

respirators have become much more specific. Breathing gas containers must be identified near the valve with the word AIR or OXYGEN, whichever is appropriate, in letters at least $\frac{1}{25}$ th the diameter of the cylinder and at least $\frac{1}{8}$ th inch high. Department of Transportation (D.O.T.) cylinders must be tested at least every five years as prescribed in the Shipping Container Specification Regulations of the Department of Transportation. The compressor supplying the air must have a pressure gauge, relief valve, and drain line as well as various other safety devices. The couplings for air-line respirators must be incompatible with those for other gases to prevent inadvertent servicing of air-line respirators with non-respirable gases or oxygen.

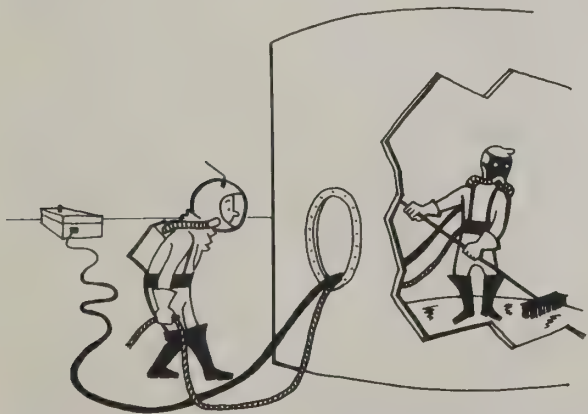
Employees using respirators must be supervised carefully for several reasons. They should be watched for signs of physical or mental stress. Regular evaluations of the work area should be made so that employees can be warned if the work environment becomes more hazardous.

In an atmosphere immediately hazardous to life or health, all workers must be equipped with approved respiratory equipment and able to communicate with one another. At least two people are required to be on the job under such conditions. As a safeguard, at least one standby person with suitable rescue equipment must be in a location which will not be affected by any likely accidents.

Contact lenses are not to be worn in an atmosphere where a respirator is required. A person should not be assigned to a job requiring the use of a respirator unless he is physically able to perform the work while using the respirator.

Gas mask canisters must be color coded and labeled in compliance with the U.S. Bureau of Mines coding system before being placed in service.

A copy of the new Section 5144, which covers the new respiratory standards in their entirety, is available through the General Industry Safety Orders Amendment Service, Documents Section, P.O. Box 20191, Sacramento 95820.



At least two people are required under immediately hazardous conditions.

SAFETY ORDERS PRICE LIST

Title 8 of the California Administrative Code contains regulations and standards from all divisions of the Department of Industrial Relations. It includes the California Safety Orders in Part 1, Chapter 4 of Title 8. Subchapters containing Safety Orders for specific industries are also available.

Individual Safety Orders are sold current to the date of sale by all District Offices of the Division of Industrial Safety. Later amendments are available on an annual subscription basis through the Documents and Publication Section only. Safety codes are amended frequently so it is advisable to subscribe to the amendment service in order to keep current with the rapidly evolving standards. If no amendments are made during the subscription period, subscriptions will be renewed for one year at no additional cost.

Money orders and checks payable to the State of California must be received at the time an order is placed. Six percent sales tax should be added for Safety Orders delivered to California addresses. Taxes are subject to change by state, county, or city governments.

If individual Safety Orders are purchased from a DIS District Office and the amendment service is desired, a separate check or money order covering just the cost of the amendment service must be completed by the purchaser; the District Office does not sell subscriptions to the amendment service but will forward the purchaser's payment and order to the Documents Section as a service.

Allow a minimum of thirty days for an order placed with the Documents Section to be shipped. Prices are subject to change without notice.

BASIC PUBLICATION (Current to date of sale)

Item	Description	Price*	Item	Description	Price*
Title 8 (complete)	Industrial Relations (all divisions/safety orders)	\$35.00	Sub.Ch.13	Logging/Sawmill Safety Orders	3.00
Pt.1,Ch.3.2, 3.3,3.5,4	Div. of Ind. Safety,CAL/OSHA (all safety orders)	30.00	Sub.Ch.14	Petroleum Safety Orders Drilling/Prod.	3.00
Pt.1,Excp't Ch. 3.2,3.3,3.5,4*	Industrial Relations, excluding Safety Orders	10.00	Sub.Ch.15	Petroleum Safety Order Refining/Transp./Handling	3.00
Pt.1, Ch.4, Sub.Ch.1,2,7*	Pressure Vessel, General Ind. Safety Orders	10.00	Sub.Ch.17	Mine Safety Orders	3.00
Sub.Ch.3,7*	Compressed Air, General Ind. Safety Orders	8.00	Sub.Ch.18	Ship-Boat Building Safety Orders	3.00
Sub.Ch.4,7*	Construction, General Ind. Safety Orders	8.00	Sub.Ch.20	Tunnel Safety Orders	3.00
Sub.Ch.5,7*	Electrical General Ind. Safety Orders	8.00	Sub.Ch.21	Window Cleaning Safety Orders	3.00
Sub. Ch. 6,6.1,7*	Elevator, Tramway General Ind. Safety Orders	10.00	"Z" Registers	Notice of Proposed Hearings	20.00
Sub.Ch.7	General Industry Safety Orders	5.00			

AMENDMENT SERVICE (Annual Subscription)

Item	Description	Price*	Item	Description	Price*
Title 8 (complete)	Industrial Relations (all divisions/safety orders)	\$40.00	Sub. Ch.4,7*	Construction, General Ind. Safety Orders	10.00
Pt.1,Ch.3.2, 3.3,3.5,4	Div. of Ind. Safety,CAL/OSHA (all safety orders)	30.00	Sub. Ch.5,7*	Electrical General Ind. Safety Orders	10.00
Pt.1,Excp't Ch. 3.2,3.3,3.5,4*	Industrial Relations, excluding Safety Orders	15.00	Sub. Ch. 6,6.1,7*	Elevator, Tramway Gen. Ind. Safety Orders	15.00
Pt. 1, Ch.4, Sub.Ch.1,2,7*	Pressure Vessel, General Ind. Safety Orders	15.00	Sub.Ch.7	General Industry Safety Orders	7.00
Sub.Ch.3,7*	Compressed Air, General Ind. Safety Orders	10.00			

* The price of the amendment service is in addition to the basic price of the Safety Orders. For example, Title 8 (complete) with the amendment service would cost \$75.00 (\$35.00 for the basic publication plus \$40.00 for the amendment service).

NOTE: There is no sales tax for any of the AMENDMENT SERVICES.

HOW EMPLOYERS CAN MAKE USE OF CAL/OSHA

John M. Inman
Safety and Health Services Manager
State Compensation Insurance Fund

You can make CAL/OSHA work for your benefit. Change is often threatening to us. It tends to disturb our sense of well-being. We usually feel more comfortable with familiar things; anchor points, for example, such as the way we customarily handle our problems and our operations. The unknown makes us uneasy and we even feel threatened sometimes by new things. Many provisions of OSHA and CAL/OSHA seem threatening to us. To mention a few:

1. The cost of meeting safety standards.
2. The paperwork of recording and reporting.
3. Employee involvement. Employees have the right to complain directly to the U.S. Department of Labor and the Division of Industrial Safety.
4. Union involvement is also a factor of some concern to us.

However, look at CAL/OSHA as an opportunity. If we accept it and use it, we can reduce costs due to injuries—something we have been trying to do for years with really not as much success as we would like. Because of CAL/OSHA emphasis on injuries and illnesses will probably result in an increase in claims during the next two or three years, especially in the industrial health area. After that, there will undoubtedly be a definite downward trend, well below today's claims levels.

The Cost of Compliance

Let's take a look at the first provision, the cost of meeting safety standards. Compliance with OSHA standards certainly doesn't come cheaply. In the long run, the investment will lower costs for workmen's compensation and reduce lost time and down time due to accidents and illnesses. The result will be a net financial gain. The management of companies inclined to gamble should be on notice that if CAL/OSHA calls their bluff, the expense may be greater than meeting safety standards.

Business spending for employee safety and health, nationwide, is rising substantially this year and will do so in the years to come. In 1972, it is estimated that 2½ billion dollars was spent for employee safety and health. This figure represents about 2.8% of all capital spending for the year. In 1973 it is expected that 3.16 billion dollars will be spent, which is about 3% of all capital spending for the year. By 1976 the figure should be around 3½ billion, but will hold at 3% of capital spending.

The cost of meeting safety standards is different by industry types. Of all industries, probably manufacturers will have the sharpest increase. The National Association of Manufacturers made a recent study by size of the company to determine what it will cost to meet the safety standards of OSHA. The following estimates were made:

It is expected that in a company of 100 or fewer employees, the company will have to spend about \$33,000. In a company with between 500 and 1000 employees, \$212,000 is the expected average. For a company of 2,000 to 5,000 employees, \$863,000 will be the average

expenditure for meeting safety standards. For a company with over 5,000 employees it can be anywhere from 1 million to 7 million dollars.

Although the cost of compliance with OSHA standards and the increasing costs of employee safety and health programs are clearly substantial, these costs are dwarfed by the annual costs of accidents to industry.

According to the National Safety Council's figures, accidents cost industry 11.6 billion in 1972. This estimate includes 2.6 billion in lost wages for injured workers, 1.6 billion in insurance administrative costs, 1 billion in medical costs, 5.2 billion in lost wages for workers not directly involved in accidents who stopped to help, conducted accident investigations, or wrote accident reports, and finally, 1.1 billion in direct fire losses. The latest data from the Social Security Administration shows 3.47 billion dollars in workmen's compensation benefits were paid in the United States to workers in 1971. Considering these costs, it's not hard to see how investment in safety pays. As accident rates drop, the cost of workmen's compensation, lost time, and down time drops with them.

As Assistant Secretary of Labor for OSHA, John Stender, stated earlier this year in a speech to the Associated General Contractors, "I would like to point out that it is to your advantage, economically, to cooperate with us in making your job safer. Each of you know what it means to have a man injured on the job. In terms of time wasted, delays in meeting construction due dates, and lowered employee morale, accidents are expensive."

Recordkeeping

The second provision that seems quite a little problem to us is that of the paperwork involved in recordkeeping and reporting. We think, "Well, some more recordkeeping stuff. I've made enough reports to the Government now." But it really isn't that bad. The forms have been simplified and are pretty easy to fill out.

There are other reasons to keep records that you shouldn't overlook. The first of these is accident analysis. As Safety Manager for the State Fund, I have the responsibility of looking over all the injury reports of our own employees. In one of our Southern California offices, not so long ago, a report came through of a 55-year-old lady who acquired bursitis while working on a particular filing device. Of course, my first reaction to this was, "Well 55, you know, bursitis is a common thing," so I filed the case mentally. In a month or two I got another such injury report of bursitis and it turned out to involve a person handling the same kind of filing equipment. This immediately alerted me to possible defects in this equipment which, as it turns out, were found. The equipment was not engineered properly so we changed to another type. This is one illustration of how accident analysis can be helpful to you in ascertaining what causes accidents. Then you can do something about them.

(Continued on page 6, col. 1)

The second reason recordkeeping helps you is because records are a device for letting employees know what is happening so they can be alert to their own well-being.

The Employee's Role

The third area is that of employee involvement. Employees have the right to complain about job safety hazards to the Division of Industrial Safety or the United States Department of Labor. You may have heard that 85% of all accidents are due to the human factor and only about 15% to the physical factor. This indicates pretty clearly to us that people are a vital part of our successful reduction of losses. There really isn't as much employee involvement as we'd like. All too often the employee's attitude is "Safety rules and problems are the bosses' responsibility. It's his problem. Why should I worry about it?"

We sometimes inadvertently turn the employee off. For example, an employee slips on the floor and is injured. A supervisor's accident report is completed. There is a question on it—"What have you as a supervisor done to prevent another such accident?" The answer we usually write is, "I told my employee not to do that again." The non-verbal message to the employee is, "You are stupid." I think any of us would react negatively to this approach. How much better it would be to say to that employee, "What do you think we should do to help other employees to avoid this kind of accident. You are the expert. You've been through it." The employee will respond with the feeling that he is part of the team. If an employee makes the effort to complain about a job safety hazard, it could be a first step for him in assuming responsibility for on-the-job safety.

Union Participation

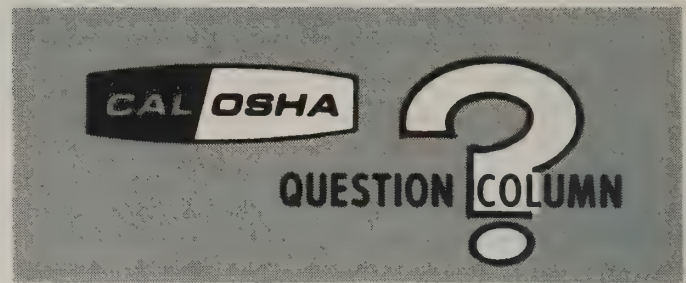
Another area of concern is that of union involvement. In a recent survey by the Bureau of National Affairs, safety and health clauses were mentioned in 65% of union contracts. The majority of such clauses were limited to a general statement of company intent to provide safe and healthful working conditions and to eliminate the causes of accidents. Most of the contracts recognized management's basic responsibilities for safety but didn't go much farther. However, it has been contended by labor law specialists that such a clause provides the basis for sending safety and health grievances to arbitration under the contract's grievance procedure.

The union role seems to be more to frame general policies to make clear the union role on safety and health issues and to push for special demands, like company-paid protective equipment. This emphasis on safety by unions should result in reductions in management's accident and injury costs.

CAL/OSHA's Positive Impact

I suggest that you consider OSHA and CAL/OSHA as an opportunity to reduce your injuries and illnesses due to accidents. Sure, you can fight it, but that would be a losing battle.

How much better and more useful to accept the difficult things about CAL/OSHA and make every effort to squeeze all the benefits you can from it.



1. Do employees of California contractors engaged in work projects on Federal reservations come under the CAL/OSHA program and if so, how do DIS Compliance Safety Engineers service these types of employments?

Answer: Yes, such employees do come under CAL/OSHA program unless and until it interferes with Federal function and purpose.

2. Is a subcontractor responsible for hazards created by others?

Answer: Yes, if the subcontractor has exposed his employees to the hazard which was created by others.

3. Why is there no index with the recently published Low Voltage Electrical Safety Orders?

Answer: The printer inadvertently left out the index when reprinting the orders.

The new index is now at the printer's.

4. Are office machines such as electrical typewriters and refrigerators required to be grounded?

Answer: Yes, Section 2382 requires that exposed non-current carrying metal parts of electrical equipment which are liable to become energized shall be grounded.

5. Does the 300 volt limit for energized conductors (Construction Safety Order 1761(g)) apply to an electrical contractor's workers performing work in a fixed plant which is running, such as an oil refinery?

Answer: This question does not indicate what type work the men are performing. As the question referenced 1761(g) we assume that it is temporary power and lighting. The workmen then would be subject to the 300 volt limit.

6. Does the 10 feet clearance from overhead high-voltage lines apply to neon sign workers engaged in the erection and maintenance of such signs?

Answer: Yes. Section 2946 prohibits all operation, erection, or handling of tools, machinery, equipment, apparatus, materials, or supplies closer than the minimum required clearance of energized high voltage lines. This minimum is 10 feet for lines of 750-50,000 volts phase to phase.

An incorrect answer was given to the question, "Can a consultant grant or recommend a variance?" which appeared in the September 1974 issue. The answer to the question is, no. A consultant may inform an employer of the procedure to be followed in applying for a variance—temporary or permanent.

THE APPEALS SYSTEM



When an employer is cited for violations of the Safety orders, he has the right to appeal the validity of the citation, the penalty, the abatement period and the reasonableness of the changes required to abate the condition. An employee or an employee's representative may appeal the validity of the date by which a violation is required to be abated. A procedure for the orderly conduction of appeals is outlined in California Occupational Safety and Health Act (AB 150).

FORMAL APPEAL

The Occupational Safety and Health Appeals Board

California Occupational Safety and Health Act (AB 150) provides for the creation of the Occupational Safety and Health Appeals Board. It consists of three members appointed by the Governor subject to the approval of the Senate. One member is from management, one from labor, and one from the general public. They are appointed to four year terms. The function of the Appeals Board is to decide, when contested, the validity of citations, penalties, and abatement dates which the Division of Industrial Safety has issued.

Filing an Appeal

An employer, an employee, or the representative of an employee must notify the Occupational Safety and Health Appeals Board that he wishes to appeal within fifteen days of receiving a Citation (CAL/OSHA 2-A) or Notice of Civil Penalties (CAL/OSHA 3) from the Division of Industrial Safety. Each of the forms briefly describes the procedure for making an appeal.

The appellant may make notification of his intent to appeal via a letter to the Appeals Board or by completing a form called a Notice of Contest, which may be obtained upon request from any District Office of the Division of Industrial Safety. If the appellant notifies the Appeals Board of his intent to appeal in a letter, he will be required to submit the completed Notice of Contest form, also.

The Appeals Board will notify the appellant that his appeal has been docketed. He will be notified at another time of the date, time, and place of his appeals hearing.

The abatement date is held in suspense during the appeal's proceeding. The average amount of time for the appeals process to take place is 62 days, though some cases take much longer and some are decided more quickly.

Preparing for the Appeal

There are several ways the appellant can prepare for his appeal. He should review the official documents of the case; the Citation, Notice of Civil Penalty, Notice of Contest, and if one was written, the initial letter the appellant wrote to notify the Appeals Board of his intent to appeal. He should gather evidence to support his appeal such as witnesses and auxiliary documents. Key questions should be developed to pose to the Compliance

Engineer who made the inspection for purposes of cross examination.

The Appeal

Appeals hearings are held at various locations throughout the State in public buildings. The proceedings are heard by a Hearing Officer who has been appointed by the Appeals Board. Hearing Officers are all experienced attorneys. The Hearing Officer recommends the decision and finds the facts of the case for the Appeals Board. The Appeals Board reviews the Hearing Officer's findings and makes its decision on the information he presents.

The hearing is relatively informal. Usually, the appellant, the Division representative, and the Hearing Officer hold the proceeding around a table rather than in a formal courtroom setting. When neither party is represented by an attorney, testimony is generally given in a narrative fashion, rather than through question and answer. A court reporter makes a transcript of the hearing.

It is not required to be represented by a lawyer at the appeals proceeding. The Division seldom is represented by a lawyer. The Compliance Engineer who made the inspection which resulted in the contested citation and penalty usually represents the Division.

Petition for Reconsideration

If the decision of the Appeals Board is not satisfactory to the appellant or the Division, either may ask the Board to reconsider its decision by filing a Petition for Reconsideration. The abatement date is held in suspense for an additional ten days after the Petition for Reconsideration is filed unless otherwise directed by the Appeals Board. The Appeals Board may or may not choose to reconsider the case.

Role of the Civil Courts

If the appellant or the Division still is not satisfied with the Appeal Board's decision, he may apply to the Superior Court of the county in which he resides for a writ of mandate. The application for writ of mandate must be made within thirty days of the time the Petition for Reconsideration is denied, or thirty days after the filing of the decision following reconsideration by the Appeals Board. The Superior Court will review the decision of the Appeals Board on the following grounds only:

- (a) The Appeals Board acted without or in excess of its powers.
- (b) The order or decision was procured by fraud.
- (c) The order or decision was unreasonable.
- (d) The order or decision was not supported by substantial evidence.
- (e) If findings of fact are made, such findings of fact support the order or decision under review.

If an appellant decides to take his case to the civil courts, it would be advisable for him to obtain the services of a lawyer.

(Continued on page 8)

From
**AGRICULTURE AND SERVICES AGENCY
DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF INDUSTRIAL SAFETY**

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(Appeals System, continued)

INFORMAL APPEAL

When an employer is cited for a violation, the employer, an employee, or the employee's representative may appeal the appropriateness of the abatement date at an informal conference. The Compliance Engineer who discovered the violation represents the Division and the District Manager of the Division presides. The District Manager may adjust the date if he feels the current one is inappropriate. The fact that an informal appeal is made does not change the fifteen day time limit for filing a formal appeal.

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5274
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
Los Angeles (North)	8155 Van Nuys Blvd. 91402	213-988-6141
Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

District Offices

Bakersfield	225A Chester Ave. 93301	805-324-6437
Concord	1070 Concord Ave. 94520	415-676-5333
El Monte	3415 Fletcher Ave. 91731	213-572-6960
Fresno	2550 Mariposa St. 93721	209-488-5302
Long Beach	230 E. Fourth St. 90802	213-432-8443
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-3861
Modesto	1800 Coffee Rd. 95355	209-529-7751
Oakland	1111 Jackson St. 94607	415-464-0660
Panorama City	8155 Van Nuys Blvd. 91402	213-782-1800
Redding	1421 Court St. 96001	916-246-1621
Sacramento	2422 Arden Way 95825	916-445-5818
Salinas	21 W. Laurel Dr. 93901	408-449-7235
San Bernardino	303 W. Third St. 92401	714-383-4321
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	3704 State St. 93105	805-682-2578
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
Vernon	2833 Leonis Blvd. 90058	213-589-5848

Field Offices

Chico	555 Rio Lindo Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
Ukiah	264 E. Smith St. 95482	707-462-8850
Ventura	5740 Ralston St. 93003	805-644-8219

(Consultants, continued)

All of us involved in occupational safety in the Department of Transportation are certainly pleased to know that qualified assistance is available from your unit to answer our concerns and questions. Once again, thank you for your assistance.

Robert L. Negri
Departmental Safety Coordinator

We want to tell you how much we appreciate the time and effort that the Senior Consulting Safety Engineer and the Consulting Safety Engineer expended at Diablo Valley College in conjunction with the CAL/OSHA program. They were both most effective in explaining how occupational injuries occur and how they may be prevented. Supervisors and key personnel from various departments all through the campus were in attendance at each meeting and both speakers were well received.

A safety committee has now been formed and, hopefully, will be able to exert some influence in the pinpointing of possible unsafe working conditions and effective means of preventing injuries.

Barrie W. Bormann
Director
Administrative Services

If you would like to obtain the services of the Consultants to help you with a specific safety problem, advise on the establishment of a safety program, or speak to a group about safety, they may be reached at the following locations:

**Division of Industrial Safety
Consultant Service
State of California
1540 Market Street
San Francisco, Calif. 94102
Telephone: (415) 557-0600**

or
**Division of Industrial Safety
Consultant Service
State of California
3460 Wilshire Blvd.
Los Angeles, Calif. 90010
Telephone: (213) 388-9573**

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new and old address.



VOL. 58, NO. 4

OCTOBER 1974

Workers Warned Against Wearing Contacts on the Job

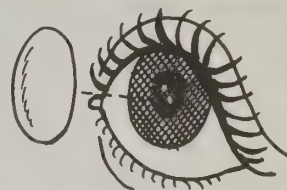
Because of increased risk to the eyes, the Division of Safety and Hygiene and the National Society for the Prevention of Blindness strongly advise that the use of contact lenses of any type by industrial employees while at work should be prohibited except in rare cases. It is further recommended that any exception be verified in writing to the employer by the physician or optometrist who sanctions such use in a specific industrial environment. Contact lenses do not provide eye protection in the industrial sense; their use without eye and/or face protective devices of industrial quality should not be permitted. To be of industrial quality, safety eye-wear devices must meet or exceed all the requirements of the "American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1-1968," or later revisions thereof, as published by the American National Standards Institute, Inc.

That contact lenses are claimed to have certain advantages in many applications outside the industrial environment is not being challenged, nor are claims which indicate that contact lens sales continue to increase. The foregoing position statement concerns only the use of contact lenses by workers in industrial settings.

There are several points regarding the use of contact lenses by industrial workers which deserve careful consideration.

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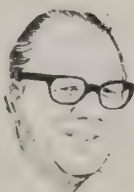
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Hazards to eyesight which are commonplace in industry, and which lend themselves to control through the use of eye and face protective devices, are magnified in their potential to cause lasting eye damage when contact lenses are worn.

With rare exception, contact lenses have few practical applications for individuals employed in manufacturing and similar plants. Most small and medium-sized industrial firms, which represent the majority in American industry, normally function without in-plant medical direction and control. Nursing services in such firms are often available only during the day work shift. Under such adverse conditions, even the problem of removing contact lenses from the eyes of an injured or incapacitated worker will assume serious proportions. Delay in removing such lenses, for example when chemicals have been splashed into the eyes, can negate the recommended copious flushing of the eyes with water.

IN DUSTY ENVIRONMENTS, small foreign particles which normally would be washed away by tears may become trapped beneath contact lenses and damage the corneas. Foreign particles may scratch or soil contact lenses. Chemical fumes may damage contact lenses and irritate the eyes, causing excessive tearing which may dis-

(Continued on page 2, col. 2)



CHIEFLY SPEAKING

Richard Wilkins

Certain unscrupulous sales representatives have been using a high pressure pitch which implies that they are representatives of the Division of Industrial Safety selling CAL/OSHA approved merchandise. Employers, please beware. The Division of Industrial Safety is not in the business of selling job safety devices. Also, it does not sanction merchandise as CAL/OSHA approved. For example, despite the advertising you may see, there is no

such thing as a CAL/OSHA approved respirator or placard. The Division of Industrial Safety will help manufacturers by examining their designs and equipment where specific approvals are required. The Safety Orders require that certain pieces of equipment be examined by the Division to assure their compliance. However, to approve wholesale a piece of merchandise as safe and CAL/OSHA approved would require a large facility to test and study products. The Division has no such facility.

If someone comes to your establishment claiming to represent the Division of Industrial Safety, insist that the person show proper identification. All Division personnel in the field carry official credentials—a green folder embossed with the Great Seal of California which contains

(Continued on page 2, col. 1)

a card stamped with the Great Seal and the signatures of the Director of Industrial Relations, the Chief of Industrial Safety, and the employee. It also contains a photo and general description of the employee. If you have doubts about the validity of the I.D., call your local District Office of the Division of Industrial Safety. The offices and phone numbers are listed on the back page of this magazine.

The sales persons of several companies in particular have been conducting mock "inspections" in work places. They have been selling safety devices to employers which are supposed to correct superficial or non-existent violations of the Safety Orders which they claim to have discovered. If you have doubts about a salesperson's integrity, the services of the Consultant Staff of the Division of Industrial Safety are at your disposal to discern the safety of a situation. The phone number of the Consultant Service in San Francisco is (415) 557-0600. In Los Angeles the number is (213) 388-9573.

If you are approached by someone who claims to represent the State of California as a job safety and health official, but who does not have proper State credentials or identification, report the incident immediately to the nearest District Office of the Division.

lodge one or both lenses. Electric arc flashes from a short circuit can cause contact lenses to adhere to the corneas. Accidental displacement or loss of a contact lens may occur without warning, thereby causing immediate incapacitation by sudden change of vision, excessive tearing, light sensitivity and involuntary squeezing together of the eyelids. Such reasoning prompted the Federal Aviation Agency to prohibit the use of contact lenses by commercial pilots.

Another important factor often overlooked where use of contact lenses in industry is concerned is "spectacle blur." The vision of either eye may be blurred when contact lenses are removed. Although the change in visual acuity is not extreme, the blurred vision may persist for as long as an hour. Should employees wear contact lenses while driving to work and then remove them, or wear them at work and remove them before driving home, the potential for accidents is all too clear. It is likely such accidents would rarely, if ever, be attributed to "spectacle blur."

All individuals who are permitted to wear contact lenses while working in an industrial setting should be identified.

The company physician, the nurse, the safety director, and especially the employees' immediate supervisor should know which workers are wearing contact lenses. It is likewise important to detect the contact lens wearer at the time of preplacement and periodic physical examination. Failure to do so can cause many problems, not the least of which is a possible discrepancy between a worker's recorded visual acuity with contact lenses in place in his true visual acuity, taken without contact lenses, after an accident. An apparent reduction of vision from an accident could result in an overly generous compensation award unless medical records substantiate what the facts really are. (WHILE CONTACT LENSES ARE DIFFICULT TO DETECT, THE EDGE OF THE LENS BECOMES VISIBLE WHEN THE BEAM OF A FLASHLIGHT IS BROUGHT TO THE SIDE OF THE EYE.)

Employees allowed to wear contact lenses in plant areas must have immediate access to appropriate corrective safety eyeglasses of industrial quality.

Optimum safety control would absolutely prohibit the use of contact lenses without other safety eyewear being worn.

Contact lenses do not provide protection for eyesight in the industrial sense. Use of contact lenses in an industrial environment without eye and face protective devices which meet or exceed all requirements of the American National Standards Institute Z87 Standard should never be permitted.

Reprinted through courtesy of MONITOR published by The Industrial Commission of Ohio, Division of Safety and Hygiene.

DID YOU KNOW . . .

Cardio-vascular incidents ranked as the second leading source of industrial deaths in 1972 with a total of 111 cases, compared with 116 in 1971, and 92 in 1970. Sixty-eight of the fatal heart attacks, strokes, etc. were sustained by firemen, police officers, or correctional employees whose deaths are presumed to be work-connected under Section 3212 of the California Labor Code.

"California Work Injuries, 1972"

Division of Labor Statistics & Research

CALIFORNIA SAFETY NEWS

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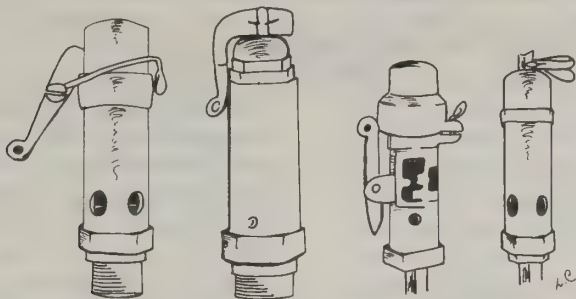
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"OPERATION AND MAINTENANCE OF SAFETY RELIEF VALVES"

by Harvey LaFlamme, Thomas A. Short Company, Oakland, California



These are common air tank safety relief valves. All are A.S.M.E. (American Society of Mechanical Engineers) air type valves. They are rated and stamped for their set pressure and relief capacity and sealed by the manufacturer.

A safety or relief valve should be on every type of pressure tank—from the hot water heater found in most homes to the huge turbine generating electricity in a power plant. As common as they are, the operation and maintenance of safety and relief valves is sometimes misunderstood. Mr. Harvey LaFlamme of the Thomas A. Short Company offered the following information about safety and relief valves in a speech given recently.

What is a safety valve?

1. It is an automatic pressure relieving device actuated by the static pressure upstream of the valve, and characterized by rapid full opening or pop action. It is used for gas or vapor service.

What is a relief valve?

2. It is an automatic pressure relieving device actuated by the static pressure upstream of the valve, which opens in proportion to the increase in pressure over the opening pressure. It is used primarily for liquid service.

Installation

3. Inlet Piping—For best results the valve should be mounted vertically either directly on a nozzle from the pressure vessel or on a short connection fitting that provides direct and unobstructed flow between the vessel and the valve. A valve should *never* be installed on a fitting having a smaller inside diameter than the inlet connection of the valve. Many valves are damaged when first placed in service because of failure to clean the connections properly when installed. Both the valve inlet and the vessel and/or line on which the valve is mounted must be thoroughly cleaned of all foreign material. The inlet connection bolts or studs should be drawn down evenly to avoid straining the valve body, to prevent distortion of the nozzle flange or base.

Outlet Piping

4. Outlet Piping—Discharge piping should be simple and direct. Where possible a short vertical pipe discharging into the atmosphere is the most desirable type of outlet piping, and affords little trouble. However, if this is impractical and the discharge must be piped to some definite place, the precautions listed below should be carefully considered.

a. Discharge piping should be designed for minimum load on the valve in that continuous high loads at high

temperature cause permanent distortion to the valve due to creep.

b. Expansion joints or large radius bends of proper design and cold spring should be provided to prevent excessive strain on the valve body under normal operating conditions. An excessive expansion load is a continual source of trouble in improperly designed installations.

c. The piping should be anchored to prevent any swaying or vibration while the valve is discharging.

d. Where possible open drains should be provided to prevent any accumulation of corrosive media in the valve body.

Storage

5. Relief valves are often on hand at the job site months before they are actually installed. Unless they are properly stored and protected their performance may be affected. Roughness in handling may damage flanges or cause misalignment of the valve parts. It is best to leave valves in shipment cases, store them in a dry place and give them a protective covering until they are to be used.

Pressure Differential

6. Another problem arises when the differential between the operating and set pressures is not great enough. Most manufacturers stipulate that the operating pressure not exceed 90% of the set pressure. Somewhere above this 90% valve the *simmer* point is approached. This point is described as the difference between the pressure on the valve when it starts to open. Operating in this area will very soon cause the valve to leak excessively due to wire drawing. On all safety valve springs where size permits, a number is stamped. These springs are adjustable within a narrow range, which varies with each manufacturer. Where a valve is to be reset to a different pressure, the manufacturers specifications must be adhered to, to insure proper lift and capacity for that pressure setting.

Accuracy

7. Another problem is that the difference in readings of pressures on gauges are accurate to approximately 3%. Adding to this error, many plants install their gages on a board several feet below the drum without compensating for head pressure.

All in all there are many factors which can create problems in the operation of safety valves.

Prevention of Flammable Vapor-Air Mixtures in Tanks and Tank Vents

Walter A. Van Sandt,* Senior Industrial Hygiene Engineer
Occupational Health Section, California Department
of Health, Berkeley

Consider the following incident. A highway tank truck is being loaded with liquid carbon disulfide. The air in the tank has been completely replaced with carbon dioxide gas before loading from bulk storage. The tank truck has been bonded and grounded following approved procedures. No water has been added to the tank.

As the tank is filled with carbon disulfide, an equal volume of carbon dioxide is displaced through the vent pipe on top of the tank. This carbon dioxide is saturated with carbon disulfide vapor as it discharges into the surrounding air.

Lightning from a sudden thunder storm ignites the carbon disulfide vapor at the end of the vent pipe. A fire on the top surface of the tank follows.

Carbon dioxide in contact with carbon disulfide will become saturated with the solvent vapor. When this gas-vapor mixture is discharged into the air, the concentration of vapor is in the explosive range. A source of ignition can cause a fire at the vent pipe discharge. Generally speaking, inert gases mixed with solvent vapor in a vent can form a combustible mixture when discharged into the air. This is a fact little realized by engineers and chemists in safety work.

The formation of flammable mixtures at a tank vent discharge occurs as follows: Under laboratory conditions; an inert gas such as nitrogen or carbon dioxide is introduced directly from a cylinder into the vent pipe. The gas may be introduced through a tee connection in the pipe. The gas may also be introduced directly into the top (or end) of the vent pipe by use of a small tube extending two or three feet down inside the vent. See Figure 1.

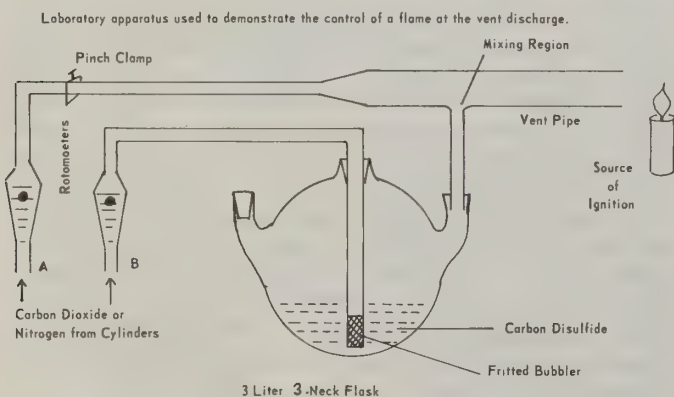


Figure 1

Referring to Figure 1, a slow stream of nitrogen or carbon dioxide, say 1.4 liter per minute, is introduced into the flask through rotometer B. The tube from rotometer A is clamped off. If an ignition source is momen-

tarily applied to the end of the vent pipe, the carbon disulfide vapor will ignite. The carbon disulfide vapor will continue to burn as long as a flow of nitrogen or carbon dioxide is maintained through the flask.

Dilution by air at the end of the vent pipe supplies sufficient oxygen to support combustion. Combustion takes place because the carbon disulfide vapor is within the explosive range after dilution with air.

Referring again to Figure 1, we allow 1.4 liters per minute of carbon dioxide or nitrogen to continue flowing through the flask from rotometer B. The pinch clamp is now opened and varying amounts of carbon dioxide or nitrogen is allowed to flow through rotometer A directly into the vent pipe as shown. The result of this test is shown in Table I.

A calculation from Table I shows the following: If we divide 6.5 liters of gas per minute by 1.4 liters of gas per minute, we get 4.65. To introduce a safety factor we might round this off to 5.0. This calculation shows us, essentially, the following: 5 volumes of inert gas must be mixed with 1 volume of carbon disulfide saturated gas to prevent ignition.

The explosive range of carbon disulfide vapor is 1-50% in air.

TABLE I

Effect on the flame of increasing flow rates of inert gases directly into the vent pipe.

Nitrogen Flow Directly Into Vent Pipe Liters/Minute	Nitrogen Flow Through Flask Liters/Minute	Flame Conditions at End of Vent Pipe
NONE	1.4	CONTINUOUS BLUE FLAME
0.5	1.4	CONTINUOUS BLUE FLAME
2.2	1.4	CONTINUOUS BLUE FLAME
2.8	1.4	CONTINUOUS BLUE FLAME
3.8	1.4	FLAME BURNS & GOES OUT 15-20 SECONDS AFTER LIGHTING
4.7	1.4	FLAME BURNS & GOES OUT 2-3 SECONDS AFTER LIGHTING
6.5	1.4	FLAME CANNOT BE LIT AT ALL

In an atmosphere of carbon dioxide or nitrogen, carbon disulfide vapor cannot exist in the explosive or flammable range. Regardless of percentage concentration, the vapor is non-combustible or non-flammable in an inert gas atmosphere. When an inert gas, saturated with carbon disulfide vapor, is discharged into the air, the vapor be-

* Mr. Van Sandt was an Industrial Hygiene Engineer with the California Division of Industrial Safety from 1963-73.

comes diluted. Our tests have shown the concentration falls within the explosive or flammable range. A source of ignition easily ignites the carbon disulfide vapor. Ignition can be prevented by adding pure inert gas to the vent pipe. See Figure 3.

Pure inert gas entering the vent pipe reduces the carbon disulfide vapor by a factor of 5 in the test apparatus. Upon dilution with air at the end of the vent pipe, the concentration of carbon disulfide vapor is less than the lower explosive limit (1%). A source of ignition cannot ignite the carbon disulfide vapor.

Practical Applications

Refer back to the highway tank truck being loaded with carbon disulfide. As noted at the beginning of this article, carbon dioxide saturated with carbon disulfide was being discharged from the tank vent pipe. Lightning ignited the mixture. This accident could be prevented as follows: A tee fitting would be placed in the vent pipe some 2 feet down from the top of the pipe. Pure carbon dioxide gas from a cylinder would be introduced into the tee. The volume of carbon dioxide added would be at a rate equal to 5 times the volume of liquid carbon disulfide entering the tank. An ignition source at the end of the vent pipe could not ignite the carbon disulfide vapor.

ETHYL ACETATE TANK TRUCK EXPLOSION:¹ STATIC ELECTRICITY

Description: At about 1:45 p.m. a tank truck being loaded with 99% ethyl acetate exploded. The tank truck loader had started to load the truck at approximately 1:41 p.m. Just before the explosion occurred, the loader heard what he described as a sizzling sound as from a frying pan. He peered into the tank but could see nothing. He moved away but held an arm over the dome opening holding a wooden gauge stick. An explosion occurred and flames shot out of the dome opening. The loader's right arm and hand received second degree burns. He jumped from the top of the truck to the ground. Torn ankle ligaments and inner thigh muscle strain resulted.

Investigation at the scene of the accident showed all grounding equipment to be in excellent condition. The hose used in loading was checked and found to have a resistance of less than 50 ohms from end to end. Questioning of personnel disclosed that regular grounding procedure had been followed by the tank truck loader. However, it was disclosed that static discharge had been heard before but not recognized as such. Static discharge had been seen jumping between the copper cups used to hold the thermometer and the loading pipe, at the start of loading. In all cases, 99% ethyl acetate had been involved. Practice of lowering the thermometer into the truck had been discontinued at the time the discharge was seen.

Cause: All evidence shows this explosion to have been due to free static electrical charge on the surface of the liquid. Discharge of sufficient energy resulted in ignition of flammable mixture.

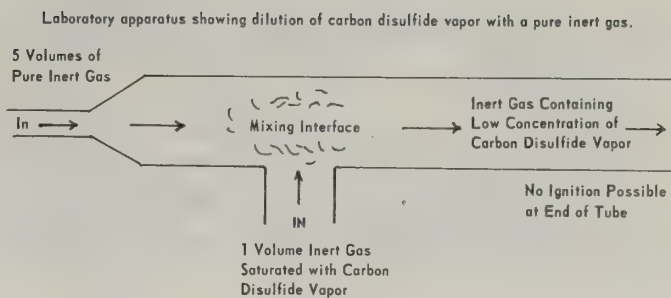


Figure 3

Preventive Measures: The tank on the truck is to be filled with carbon dioxide or nitrogen before filling with ethyl acetate begins. A vent with a side arm similar in design to Figure 3 is to be placed on top of the tank. Pure carbon dioxide or nitrogen from a cylinder is to be introduced into the tee. The carbon dioxide or nitrogen is to be added at a rate equal to 5 times the volume of ethyl acetate being loaded into the tank. No ignition source inside or outside the tank could cause an explosion.

VINYL ACETATE EXPLOSION AND FIRE—FATALITY²

Description: Two operators were preparing to fill a tank car with vinyl acetate. One climbed to the top of the car with nozzle end of loading hose while the other made connection to transfer pump at ground level. A few seconds after valve was opened to admit vinyl acetate to the hose, an explosion followed by fire occurred. The operator on top of tank was thrown to the ground, sustaining a fractured skull and multiple body burns. He died as a result of the injuries.

Cause: Although sparks might have resulted from contact of the nozzle with rim of loading aperture, investigation indicates the explosion was probably caused by static sparks from the steel nozzle to the tank car. The nozzle had not been bonded to the car to prevent static accumulation.

Preventive Measures: The tank car is to be filled with carbon dioxide or nitrogen before pumping in vinyl acetate. Also, the end of the loading hose shall be extended down into the inert gas atmosphere within the tank. A tee type vent should be installed on the tank. Inert gas passed into the tee at a rate of 5 times the liquid filling rate will prevent accidental fire and explosions.

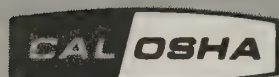
The flammable or explosive characteristics of solvents in tanks is related to the chemical composition of the solvent and the climatic temperature.

Flammable and explosive range mean the same thing. Either term defines the range in which a material can flash or explode when mixed with proper proportions of air if ignited. These limits define the upper and lower percentages as expressed in percent by volume in air.

Above the upper flammable limit means the quantity of solvent vapor in the air is of such a high concentration that ignition is not possible. Below the lower flammable limit means the quantity of solvent vapor in the air is of such low concentration that ignition is not possible.

¹ Case Histories of Accidents in the Chemical Industry. Manufacturing Chemists Association. Volume II, January 1966, Page 193

² Ibid. Volume I, July 1962, page 106



QUESTION COLUMN

Question: 1. Can I get the consultants to make a complete inspection of my facilities?

Answer: No. Consultants normally will consult only about specific problems, processes, procedures or practices. The federally approved California Occupational Safety and Health Plan forbids consultation to interfere with compliance activity. If wall to wall inspections were permitted without the issuance of citations and the levying of fines, the consultant function would cross paths with the compliance function. It would be a breach of the OSH Plan.

Question: 2. How does an employer get consulting services relating to noise surveys and who has prime responsibility for this type of activity?

Answer: The Consulting Unit of the Division of Industrial Safety will participate in gross noise evaluations. More refined or technical evaluations may be completed by the California State Department of Health upon request of the Consultant Unit. The Health Department has the sophisticated equipment and expertise which better qualifies it to make refined evaluations.

Question: 3. Will the Division provide in-plant safety training for maintenance personnel?

Answer: Yes, and has already put on several such programs. Many of the programs are of the work shop type. Safety problems common to the maintenance field are covered through open-ended discussion as well as films, pamphlets, and demonstrations.

Question: 4. Why doesn't the Division's Consulting Unit work more closely with manufacturers in the design of equipment so that said equipment will be in compliance when sold to the consuming public?

Answer: The Consulting Staff does work with manufacturers who request its services. The Consultants will respond to questions regarding the design of a specific part of the equipment. However, the Division cannot take the responsibility involved in determining whether the entire design of a piece of equipment is safe.

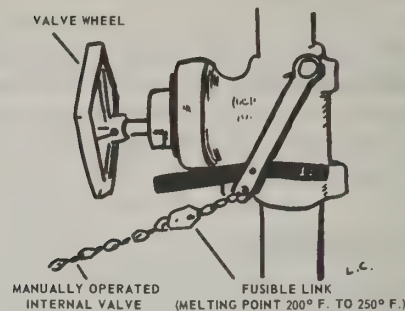
CAL/OSHA QUESTIONS, PLEASE

Please send questions concerning CAL/OSHA to:

Division of Industrial Safety
Education and Research Unit
455 Golden Gate Ave.
San Francisco, Calif. 94102

POSITIVE CHECK VALVES SAVE LIVES

Paul Cicileo
Safety Engineer
Division of Industrial Safety
State of California



On a voluntary basis, some liquid propane gas dealers are installing a positive check internal valve on many small dispensing units at gas stations, warehouses, and on farms. They are installed on 250, 499, and 1100 gallon water capacity tanks and exceed the Division of Industrial Safety requirements.

On two occasions the installations have prevented a serious fire or explosion. On one occasion, a forklift driver was filling a bottle when the brake was accidentally released and the forklift started to move. The one-half inch liquid fill hose cracked, spilling liquid propane gas, but not enough to close the excess flow valve. The driver ran away yelling. A shop maintenance man was nearby and he closed the valve from a remote point. The cable holding the valve open was at a point near a fenced enclosure so it was accessible to the maintenance man.

The other occasion was at a service station. A small crack in the liquid propane gas hose inundated the area with gas. The operator closed the internal valve from a remote point and stopped the spill.

In these instances, an excess flow valve would not have closed. Without the remote operation, there could have been serious fires and possibly injuries.



FILM FOCUS

. . On Accident Prevention

"Incident: Symptom or Cause," a film recently acquired by the Division, provides excellent information about accident prevention and is a valuable asset for safety meetings or discussions.

An iceberg model is used to demonstrate that accidents which happen stem from a greater number of potential or near accidents which exist in the daily work environment. The causes of the accidents which actually occur usually receive a great deal of attention while the causes of potential or near accidents are largely neglected; even though they are the culprits which eventually lead to injuries and fatalities. The message of the film is that eliminating hazards in the work environment makes an operation more efficient as well as safer.

The film is available to the public upon written request without charge.

What to Expect When a CAL/OSHA Compliance Engineer Inspects Your Work Place or Business



Who Is Inspected?

Nearly every place of employment in California is subject to inspection by a CAL/OSHA Compliance Engineer. However, several factors determine which places of employment will be inspected before others.

The Division of Industrial Safety is required to investigate within three days occupational accidents which involve fatalities or which cause serious injury to five or more employees. It is also required to investigate within three days complaints it receives from an employee, the legal representative of an employee, or an employer.

Follow-up inspections are required to assure that serious violations found during a previous inspection have been corrected. Complaints received from someone other than an employee, the legal representative of an employee, or an employer are investigated if they appear to have merit.

Other places of employment are inspected according to a list which is issued through the Regional Managers of the Division of Industrial Safety to the District Managers. The list contains the names of work places which have a high potential risk of occupational injuries and illnesses.

Advance notice of an inspection is forbidden by law except under extremely unusual circumstances.

How is an Inspection Conducted?

The Compliance Engineer will enter the place of employment without advance notice in nearly all cases. He will introduce himself and ask to see the employer or a representative of the employer, if the employer is unavailable. All Compliance Engineers carry a green leather encased identification card imprinted with the Great Seal of California, a description and picture of the Engineer, and the signatures of the Chief of the Division of Industrial Safety and the Director of Industrial Relations. The Compliance Engineer will show the employer this I.D. card so that the employer may be certain the Compliance Engineer is, in fact, a representative of the Division. The Compliance Engineer will also give the employer a business card.

The Compliance Engineer will explain that the purpose of the visit is to inspect the premises for safety. He will explain the penalty system and will ask the employer for information concerning the size of the operation, the number of people employed, the type of business, etc. He will ask to see the OSHA Log of Occupational Injuries and Illnesses, injury reports, and minutes of safety meetings, if any exist. He will ask the employer whether a safety program is being maintained and will want details on its functioning. The employer is required by law to make available all the records the Compliance Engineer requests to aid him in his investigation.

At this point, the Compliance Engineer will conduct a walk-around inspection of the premises. A representative authorized by the employees is permitted by law to accompany the Compliance Engineer. The employer or



a representative of the employer is also permitted to accompany the Compliance Engineer. Either individual may speak privately to the Compliance Engineer about safety problems during the investigation.

If the employees do not have an authorized representative, the Compliance Engineer will consult with several employees concerning health and safety in the work place.

As the Compliance Engineer makes his walk-around inspection, he has the right to take pictures or draw sketches of unsafe conditions. He will most likely take notes on the conditions he finds and may require that eye-witnesses of an unsafe condition sign a statement verifying that a hazard exists. The Compliance Engineer will learn who has been exposed or is being exposed to an unsafe condition and may require their names. He may confiscate a sample of the violation as evidence when it is practical to do so.

If the Compliance Engineer finds an unsafe condition which holds an immediate threat to life or could cause serious injury, he will forbid the functioning of the hazardous operation until it has been made safe.

After the walk-around inspection, the Compliance Engineer will hold a discussion with the employer concerning his observations. He will evaluate the employees safety program. If no hazards or violations were found, the Compliance Engineer will inform the employer. If hazards and violations were found, the Compliance Engineer will explain them and respond to any questions the employer may ask which the Compliance Engineer feels qualified to answer. The Compliance Engineer will also discuss the period of abatement and will set dates which will allow a reasonable time period for the violations to be corrected.

If the Compliance Engineer suspects that unsafe conditions exist which require monitoring beyond his expertise, he may call another agency to conduct an additional inspection. For example, if he suspects that the concentration of chemicals in the atmosphere is too high for safety, he might call the Health Department and ask them to make a survey. The employer will be told if another agency will be continuing the investigation.

How Violations are Handled

From the information the Compliance Engineer has gathered, Citations and a Notice of Civil Penalties will be determined and mailed to the employer. The employer, at this point, may appeal the citations, the penalties, or the abatement period as unjust or unreasonable.

What Happens if an Employer Refuses to Permit the Compliance Engineer to Inspect the Premises?

If the Compliance Engineer displays proper identification, the employer is required by law to permit him to inspect the premises. The official Division Identification Card is considered proper identification. If the employer

(Continued on page 8, col. 1)

From
Agriculture and Services Agency
DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF INDUSTRIAL SAFETY
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refuses to permit entry despite the proper I.D., he is liable for criminal prosecution.

The Compliance Engineer may gain entry, upon an employer's refusal, with an Inspection Warrant from the local court and will, in the company of a police officer if necessary, carry out his investigation.

How are Trade Secrets Protected?

The trade secrets of an operation which are learned in the course of an inspection will be considered confidential by the Division of Industrial Safety. Revelation of such secrets is, except to authorized persons, a misdemeanor.

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

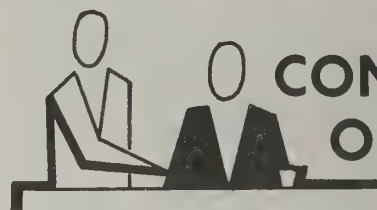
Fresno	2550 Mariposa St. 93721	209-488-5274
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
Los Angeles (North)	8155 Van Nuys Blvd. 91402	213-988-6141
Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

District Offices

Bakersfield	225A Chester Ave. 93301	805-324-6437
Concord	1070 Concord Ave. 94520	415-676-5333
El Monte	3415 Fletcher Ave. 91731	213-572-6960
Fresno	2550 Mariposa St. 93721	209-488-5302
Long Beach	230 E. Fourth St. 90802	213-432-8443
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-3861
Modesto	1800 Coffee Rd. 95355	209-529-7751
Oakland	1111 Jackson St. 94607	415-464-0660
Panorama City	8155 Van Nuys Blvd. 91402	213-782-1800
Redding	1421 Court St. 96001	916-246-1621
Sacramento	2422 Arden Way 95825	916-445-5818
Salinas	21 W. Laurel Dr. 93901	408-449-7235
San Bernardino	303 W. Third St. 92401	714-383-4321
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-0660
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	5276 Hollister Ave. 93111	805-964-3554
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
Vernon	2833 Leonis Blvd. 90058	213-589-5848

Field Offices

Chico	555 Rio Lindo Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
Ukiah	264 E. Smith St. 95482	707-462-8850
Ventura	5810 Ralston St. 93003	805-642-1475



CONSULTANTS ON THE JOB

The Consultant Staff of the Division of Industrial Safety is available to labor organizations, employee groups, and employers for advice on specific safety problems. It will also provide speakers for groups who are concerned with safety. Examples of the types of activities in which the Consultants have recently been involved include the following:

- Consultants at safety exhibit for the purpose of answering questions about the Division and CAL/OSHA.
- Discuss application of Safety Orders to a stage lift material hoist under design.
- Inspect overhead crane for compliance with Safety Orders.
- Inspect portable work lights for safety in a commercial garage.
- Lecture on trench shoring to an employee group.
- Advise on upgrading a school districts' safety program.
- Discuss an accident involving a swing cut-off wood-working saw to examine why it happened and how it could be prevented.
- Provide interpretation of the Safety Orders and how they apply at the job site of a roofing operation.
- Initiate a safety program for supervisors.
- Inspect work site under high voltage lines for safety clearance.

If you would like to use the services the Consultants provide, they may be contacted at the following locations:

Division of Industrial Safety
Consultant Service
State of California
1540 Market Street
San Francisco, Calif. 94102
Telephone: (415) 557-0600

OR
Division of Industrial Safety
Consultant Service
State of California
3460 Wilshire Blvd.
Los Angeles, Calif. 90010
Telephone: (213) 388-9573

California Safety News

VOL. 58, NO. 3

SEPTEMBER 1974

State Surpasses Goal for Reducing Lost Time Injuries

"The Governor's Safety and Rehabilitation Program" successfully reduced the frequency of lost-time injuries to state employees in 1973 for the fourth consecutive year. This announcement was made by James G. Stearns, Secretary of the Agriculture and Services Agency and Governor Ronald Reagan's Cabinet Coordinator for the project. The program is managed by the State Compensation Insurance Fund.

Speaking at a special awards ceremony in Sacramento, Stearns reported that the number of injuries per million man-hours worked has been reduced from a rate of 18 in 1970 to 11.4 in 1973. The reduction is particularly significant considering the program covers over 150,000 state employees. "This represents an equivalent of almost 2,000 people being spared the effects of a lost-time injury," Stearns said.

Stearns also announced the first year's results of a statewide effort to reduce the number of days lost due to job injuries. "This important addition to the Governor's Program has allowed injured employees to return to gainful employment an average of 6 days sooner this year compared to 1972," explained Stearns.

Because of the program's success, the financial burden to California taxpayers will be increased at a rate substantially lower than the corresponding costs of medical care and workmen's compensation benefits.

In a letter congratulating all state departments, Gov-



James McCullough, Deputy Director of Industrial Relations, accepts the First Place Award for reduced employee accident severity from James Stearns, Secretary of the Agriculture and Services Agency.

ernor Reagan noted that the statewide goal to reduce the injury rate by 10% had been met, and the newly instigated return-to-work program was showing successful results. The Governor stated concern over the 3,139 state employees who still suffered disabling injuries during the year and set goals for 1974 intended to reduce that figure by an additional 10%.



Richard Wilkins

CHIEFLY SPEAKING

The safety engineers of the Division of Industrial Safety are among the best qualified in the country. They are selected carefully according to their technical knowledge, practical experience, education, learning ability, and attitude.

Before a safety engineer is hired by the Division, he or she undergoes a careful screening process. First, the candidate must qualify to take and subsequently pass a competitive civil service examination. In order to qualify

for the examination, one must have a degree in engineering and years of work experience related to an engineering specialty—either mining and tunneling, pressure vessels, electrical, elevators, construction, or industrial. Additional experience may be substituted for the required education on a year-for-year basis. However, the engineers actually hired have much more experience than the required year-for-year. Most have ten or fifteen years of experience.

The examination has two phases, written and oral. The written exam measures the general technical knowledge of the engineer as well as his or her expertise in a specialty. The written exam must be passed with a rating of at least 70% in order for the candidate to be considered for the qualifications appraisal interview.

(Continued on page 2, col. 1)

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The interview is conducted by a panel of four. Two members are from the public sector—one from management and one from labor. One member is from the State Personnel Board and one is from the Division of Industrial Safety. They query the candidates on their background, education, attitude, and appraise their general demeanor. Candidates are given ratings and must be rated at least 70% to pass.

The results of the two parts of the examination are combined into an average, with the written part being weighted 60% and the qualifications appraisal 40%. The qualifying candidates are listed in order according to the test results. The top three are interviewed for each opening by the Division and the person deemed best qualified is selected.

The new safety engineer must then pass through a probationary period of six months, during which time he may be discharged for incompetence, inability to learn, poor attitude, or poor work habits.

Newly hired engineers undergo a comprehensive training period. One hundred and sixty hours of formal classroom training are given in order to familiarize the engineers with the Safety Orders. Fifteen percent of the engineers' time thereafter is devoted to on-the-job training which is usually supervised by the District Managers.

The Division is proud to maintain among its engineers a balance of formal engineering background and practical experience. Dealing with complicated equipment requires that the engineers have more than a textbook understanding of the principles that make it function. The years of experience which our engineers have acquired give them the ability to make realistic, down-to-earth appraisals of occupational hazards.

The formal engineering education of Division engineers qualifies them to advise on problems and to make technical evaluations in the interest of industrial safety and efficiency.

Becoming a safety engineer with the Division is a long, highly selective process. The Federal OSHA requires that state safety engineers be qualified and California's engineers certainly meet that challenge head-on.

New Format For The California Safety News

Commencing with this, the September issue, the California Safety News will appear on a monthly basis. The more frequent publishing schedule will permit a larger amount of topical safety information to reach our readers. The format of the Safety News has also been modified to make more efficient use of its smaller size.

Regular monthly columns will appear on Division Consultant activities, new safety films and brochures, and CAL/OSHA questions. Watch for the CAL/OSHA information bulletin on page seven of every issue. The bulletins may answer many of your questions.

Comments regarding the Safety News are always appreciated.

DISTRICT OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY SELL CALIFORNIA STATE SAFETY ORDERS

As a convenience to the employers and employees of the State, California's Safety Orders are being sold over the counter at all District Offices of the Division of Industrial Safety. No mail orders will be accepted. Mail orders must still be sent to the Documents Section, P.O. Box 20191, Sacramento 95820.

Though all the various sections of Title 8, Part 1, Chapter 4 may be obtained individually at the District Offices, Title 8, Part 1, Chapter 4 in its entirety and also the amendment service are only available through the Documents Section.

HOW IMPORTANT ARE YOU ??

Our office has a new typewriter, and it works very well, except for one key. The forty-five other keys work quite well, but one key makes quite a difference.

You may say to yourself, "Well—I'm only one person; what I do or don't do won't make or break a program." But it does make a difference.

Any manufacturing organization needs active support, cooperation, and participation on the part of its employees in order to be effective.

So, the next time you think you are only one person and your efforts are not needed, remember this new typewriter, and say to yourself, "I'm a key person, and my support is needed!"

Safety Committee Chairman

CALIFORNIA SAFETY NEWS

Vol. 58, No. 3

September 1974

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HCL Storage Cylinders Pose Hazards To Users

John L. Bobis

Senior Safety Engineer

Occupational Safety and Health, Standards Board

Many of the principal users of bottled anhydrous hydrogen chloride in California industry at the present time are unaware of the potential hazards these cylinders may possess. Some may be overfilled and a slight temperature change could result in the rupture of one of these overstressed cylinders, possibly resulting in serious bodily harm and/or extensive property damage.

Anhydrous hydrogen chloride (HCl) is a colorless, pungent, corrosive gas having a suffocating odor. It is heavier than air and fumes strongly in moist air. The gas is usually stored in Department of Transportation (DOT) specified steel cylinders in the form of a gas over liquid with pressure being about 613 pounds per square inch gauged at 70°F.

Hydrogen chloride is a highly toxic gas; it is severely irritating to the upper respiratory tract and corrosive to the eyes, skin, and mucous membranes. The acid neutralizes the alkali of the tissues and causes death as a result of edema or spasm of the larynx and inflammation of the upper respiratory system.

Hydrogen chloride has many uses among which are the following: as a chemical intermediate; in the hydrochlorination of rubber; as a babbitting flux; in the production of vinyl and alkyl chlorides; in the separation of cotton from wool; in the delinting of cotton; in the manufacture of inorganic chlorides; as a catalyst and condensing agent; as a catalyst for bodying (adding viscosity) oils; and the electronic grade of hydrogen chloride is used for etching semiconductor crystals.

HCl is essentially inert to metals and does not attack the commonly used structural metals (stainless steel, mild steel) under normal conditions of use (room temperature and atmospheric pressure). In the presence of moisture, however, hydrogen chloride will corrode most metals other than silver, platinum, and tantalum, but moist or dry hydrogen chloride can be handled in baked carbon graphite and impregnated carbon and graphite materials. When used at high pressures it is necessary to use extra heavy black iron throughout. No galvanized pipe or brass or bronze fittings should be used, as these will corrode. High-pressure monel or aluminum-iron-bronze valves should be used. Users of HCl should be warned to always shut off their hydrogen chloride lines from the use end backward to the cylinders.

As it was pointed out previously, hydrogen chloride is shipped in DOT approved, high-pressure steel cylinders. DOT has explicit specifications for the manufacture of cylinders, i.e. type, size, and service pressure; inspection procedures; steel used; identification of material; welding and brazing procedures; wall thickness; heat treatment, etc. After a cylinder is manufactured to the specifications and accepted, each cylinder is identified (for example, DOT-4AB240, etc.). The serial number along with an identifying symbol both of the purchaser, user or maker is registered with the Bureau of Explosives. Size, locations, and other pertinent requirements are listed in the DOT regulations.

The Department of Transportation has strict and definite guidelines for the manufacture, identification, and transcontinental transportation of cylinders containing compressed gasses. The Compressed Gas Association, over the years, has collected data from its members for the sole purpose of attempting to inaugurate and implement a safe and "foolproof" procedure manual for every type of compressed gas to be strictly followed during mixing and filling operations. This program has not been completely foolproof and has not minimized the chance of human error to a point where it could be negligible. In fact, on August 28, 1973, human error caused a cylinder to explode and just about disintegrated the individual, in addition to causing extensive property damage. He apparently tried to fill liquid HCl into a sulfur dioxide designated cylinder. On February 28, 1974, a similar size cylinder containing liquid HCl blew up during nonworking hours at the same location, causing some structural damage to the building and damaging several other cylinders. Death or serious injury again could have occurred had the accident happened during working hours. Apparent cause of the second explosion was again human error. The supplier shipped several cylinders which were overfilled anywhere from 5 to 12 pounds.

The California Division of Industrial Safety has the responsibility of enforcing the minimum standards established by the safety orders. The safety orders regulate the storage and use (General Industry Safety Orders Sections 3301 and 4829) of compressed gasses. Section 5184 of the General Industry Safety Orders covers the operation required in mixing hazardous substances.

Strict controls over the operations of firms handling hazardous substances on a state and national level are imperative. It is not enough to have strict regulations for the manufacture of containers if individuals are allowed to misuse them. Someone must be held responsible to ensure that hazardous substances are stored in the designated containers and that the absolute limits are not exceeded. These can be achieved by (1) the use of check-off procedures, (2) all apparatus being approved by a second qualified individual, and (3) provisions of suitable barriers, along with isolation.



A truck demolished by the explosion of pressurized gas cylinders it was carrying.



SILO FILLER

Irma West, M.D.
California State Department of Health

Two workers died in a corn-drying bin at a grain elevator and storage facility in California last fall. Their deaths were most likely caused by silo-filler's disease, a hazard better known among farmers in the midwest, but apparently not as well known among grain storage operators and their employees in California.

Silo-filler's disease was first described in this country in 1954 when severe chemical pneumonia was recognized as a disease of silo workers in the midwest. The cause was inhaling the nitrogen dioxide emanating from the grain. Grain, particularly corn, when grown under certain conditions, accumulates abnormal amounts of nitrates. During the first 24 to 48 hours of storage significant amounts of nitrogen dioxide (NO_2) can be liberated.

Nitrogen dioxide gas is one of the most hazardous of lung irritants. It has a pungent, sweetish odor even at low concentrations (5 parts of NO_2 per million parts of air). It has a reddish-brown color visible only when concentrations reach a dangerous level (75 to 150 ppm). It is heavier than air and can settle at the bottom of enclosed spaces. Any concentration over 25 parts per million in the air breathed can be hazardous. The effect on the lungs is often delayed so that the victim may not realize at the time the serious nature of his exposure. Inhalation of 50 to 75 ppm in 30 to 60 minutes can cause bronchitis; 50 to 100 ppm causes chemical pneumonia; 150 to 200 ppm a severe fibrosing type of pneumonia; 300 to 400 ppm severe lung damage fatal in two to ten days; and over 500 ppm acute pulmonary edema fatal in less than 48 hours.

Most of the farm workers developing silo-filler's disease inhaled this gas while walking around the silo or in the "chute." The two workers who died in the bottom of the corn-drying bin in California were in an enclosed space where gases can build up to high concentrations. They were working alone on the night shift. The first victim was a young man who was shoveling the last couple of tons of corn from the drying bin. The second worked at the auger or heater. Apparently the second man saw that the first was unconscious and went into the bin to rescue him. Both were found dead by the day shift. They had not been suffocated by the corn as had first been assumed.

Under ordinary circumstances, corn and other grains do not emit significant nitrogen dioxide. Only when certain temperature, sunlight, and moisture conditions during the growing period interfere with the normal plant metabolism of nitrates, and/or the grain is grown in soil with excess nitrogen does the grain become hazardous. The chances of grain emitting NO_2 have increased over the past several decades because of the use of nitrogen fertilizers. Corn and other plants are "luxury feeders" of nitrogen and can take up more than they need. Drought

is another factor causing corn plants to store excess nitrates.

High nitrate concentration in grain forage causes poisoning in cattle who eat it and endangers farm animals in the vicinity of silos from which NO_2 is emanating. Children playing near silos can also be poisoned.

In California there are at least two legal requirements applicable to the prevention of silo-filler's disease. The first is that five parts of NO_2 per million in air breathed by workers throughout their work day is the maximum allowed in California (Section 5156, General Industry Safety Orders [GISO]). A second group of regulations applies to all workers entering confined spaces (Section 5182 of the GISO):

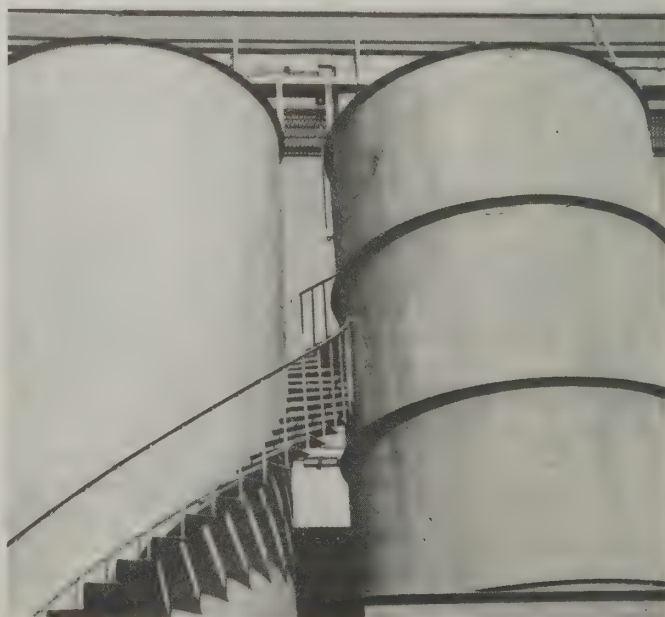
"5182. Confined Spaces. (a) When repairs, alterations, cleaning or other operations are performed in confined spaces in which flammable, poisonous, asphyxiant, suffocant, or anesthetic vapor or gases are likely to exist in hazardous amounts, the procedure shall be as follows:

"(1) Employees engaged in the operation shall be advised of hazards they may encounter.

"(2) (Not applicable.)

"(3) If the confined space is to be entered, it shall be emptied, flushed or otherwise purged of hazardous substances; and if the substance last contained in the space is of such a nature as to give rise to poisonous, asphyxiant, flammable, suffocant, anesthetic, or irritant gas or vapor under the conditions encountered in the work to be done, either:

"(A) Employees entering the space shall be protected by approved oxygen or supplied air respiratory equipment; or



Grain silos.

S DISEASE CAN BE FATAL

"(B) Sufficient ventilation shall be supplied and maintained so that the air in the space is respirable, and contains sufficient oxygen to support normal consciousness. Appropriate tests shall be made frequently to ascertain that such conditions are maintained.

"(b) An approved safety belt with a life line attached or other approved device shall be used by employees wearing respiratory equipment within tanks, vessels, or confined spaces, and also when not wearing respiratory equipment and while within tanks, vessels, or confined spaces that do test gas free but are in imminent danger of becoming gassy. If entry is through a top opening the safety belt shall be of the harness type that suspends a person in an upright position. The other end of the line shall be secured outside the entry opening. At least one employee shall stand by on the outside while employees are inside, ready to give assistance in case of emergency. If entry is through a top opening, at least one additional employee, who may have other duties, shall be within sight and call of the standby employee.

"(c) When conditions require the wearing of respiratory equipment in a confined space, at least two men equipped with approved respiratory equipment, exclusive of the employees that may be necessary to operate blowers and perform standby duties, shall be on the job. One or more of the employees so equipped may be within the confined space at the same time, provided, however, that this shall not apply to tanks of less than 12 feet diameter, when entrance is through a side manhole.

"(d) Wherever work is to be performed in a confined space, provision shall be made to permit ready entry and exit.

"(e) At least one person shall be immediately available to administer artificial respiration while work is being performed in a confined space when respiratory equipment is being worn.

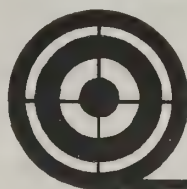
"(f) All work shall be arranged in short periods in any confined space when atmospheric conditions are nauseating or where prolonged exposure to such conditions would be harmful to the workmen."

The following recommendations come from the Midwest and are directed toward farmers with silos:

1. Allow no one to enter a silo for any purpose, from the time filling begins until seven to ten days after it is finished.
 2. Provide good ventilation about the base of the silo during this period so that toxic gases, if they develop, will be carried away.
 3. Provide fencing (or other effective means) to prevent children and animals from straying into any spaces adjoining a silo during this dangerous period.
- A question frequently asked concerns whether a de-

pendable "quick and easy" method exists to determine the NO₂ content of the air in a corn bin or silo by the workmen or farmer. There are fairly accurate and fast methods of obtaining NO₂ measurements, but only trained technicians are capable of carrying out this determination accurately.

In summary, all grain storage operators should consider that grain can emit hazardous amounts of NO₂ during the first 24 to 48 hours of storage and follow all of the applicable safety precautions just listed. For further information on prevention of this and other occupational diseases contact the Occupational Health Section of the State Department of Health, 714 P Street, Room 440, Sacramento 95814, telephone: (916) 322-2097.



FILM FOCUS

. . . On Slips & Falls

Are slips and falls a primary cause of injury in your workplace? If so, a new film available through the Division entitled, "Striking Against Objects" can, in three hilarious minutes, pinpoint some of the common traps found in office and factory situations which cause unnecessary tumbles. A perfect film for opening a safety meeting on housekeeping or slips and falls, it captivates the audience by its explicit, slapstick approach to the subject. It puts people in a receptive mood to discuss a serious subject. The film was made by the Industrial Accident Prevention Association of Ontario.

Groups interested in safety may obtain Safety films free through the Division of Industrial Safety upon written request. Send requests, including the date or dates the film is needed, to:

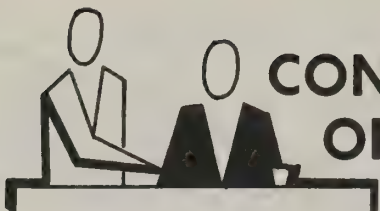
**Division of Industrial Safety
Education and Research**
State Building
455 Golden Gate Avenue
San Francisco, California 94102

In order to ensure delivery, requests must be received ten days prior to the time the film is needed. If a film is unavailable due to prior reservations, you will be informed of the situation immediately.

No more than three films may be reserved at once. Reservations may not be made for more than three months in advance. Requests made by phone are not accepted.

A pamphlet containing a list and brief description of all the safety films available through the Division may be obtained by request.

With questions, phone 557-2327.



CONSULTANTS ON THE JOB

The Consultant Staff of the Division of Industrial Safety has been responding to the many requests from the public for consulting services. Among its recent activities are the following:

- Inspect electrical equipment manufactured overseas for safety compliance.
- Consultation with water treatment superintendent regarding use of chlorine gas in water treatment and required and advisable safety precautions.
- Discuss the feasibility of a work cage suspended from a roof mounted davit to be used to clean windows on a rotating roof restaurant.
- Inspect access and work space around air conditioning units for possible violations.
- Discuss clearances required for overhead conductors above roof.
- Inspect disappearing ladders and evaluate their safety.
- Inspect power presses for safety.
- Inspect for safety a 100 foot scaffold to be used for demolition work.
- Lecture training class for apprentice carpenters.
- Participate in question and answer session with electrical inspectors from various cities throughout California.
- Presentation on machinery guarding to a group of safety engineers from private industry.
- Discuss the storage and handling of explosives.

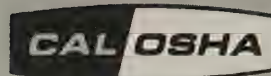
If you would like to use the services of the Consultants, they may be contacted at the following locations:

Division of Industrial Safety Consultant Service State of California 1540 Market Street San Francisco, California 94102 Telephone: (415) 557-0600	OR	Division of Industrial Safety Consultant Service State of California 3460 Wilshire Blvd. Los Angeles, California 90010 Telephone: (213) 388-9573
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Nine workers died when they breathed in an atmosphere filled with poisonous gasses or vapors.

"California Work Injuries, 1972"
Division of Labor Statistics & Research

This November, each private employer in California will be sent a booklet containing CAL/OSHA record-keeping guidelines, a log (CAL/OSHA Form 100), and an Annual Summary (CAL/OSHA Form 102) to be used in recording and summarizing occupational injuries and illnesses in 1975. If an employer fails to receive the booklet and forms before the end of this year, he should get in touch with the Division of Labor Statistics and Research to obtain them.



QUESTION COLUMN

1. I know my shop isn't in compliance with the safety orders. Can I obtain a variance from the Division or Standards Board while the violations are being corrected so that an inspector won't cite me?

ANSWER: No. You should start immediately to correct the unsafe conditions so that your plant will be in compliance when a Compliance Safety Engineer calls.

2. Can a consultant grant or recommend a variance?

ANSWER: No. A variance is only issued after a visit by a compliance engineer and a subsequent citation.

3. Who do I call if I want a speaker from the Division for a group meeting, the consultants or Education and Research staff?

ANSWER: Always call or write the consultant staff. Address and phone number for this service is as follows: For consultation service phone; San Francisco, (415) 557-0600 or Los Angeles, (213) 388-9573, or write Division of Industrial Safety, Consultant Service, State of California, 1540 Market Street, San Francisco 94102 or Division of Industrial Safety, Consultant Service, State of California, 3460 Wilshire Blvd., Los Angeles 90010.

4. The Federal OSHA has granted me an extension of the abatement date for correcting violations. Will CAL/OSHA honor the extension?

ANSWER: Yes, the CAL/OSHA compliance unit works in cooperation with the U.S. Department of Labor on inspections previously made by Federal OSHA Compliance Safety Engineers.

5. Will both the Federal and State conduct inspections?

ANSWER: Not as a regular practice. All safety inspections in California will be made by the State Division of Industrial Safety Compliance Unit. However, in the case of a catastrophe both State and Federal Compliance Safety Engineers may become involved.

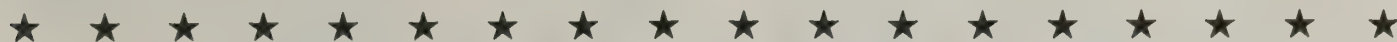
6. What are the qualifications and background of Division of Industrial Safety Engineers?

ANSWER: All Engineers of the Division of Industrial Safety are selected by the Civil Service process by examination and must meet strict engineering and experience criteria.

7. Where can an operator of a small business borrow money to make the improvements necessary for complying with the Safety Orders?

ANSWER: When the operator of a small business needs to borrow money to provide required safeguards in his plant he may contact the Small Business Administration, Financial Division, 450 Golden Gate Avenue, San Francisco 94102, or Small Business Administration, Financial Division, 849 South Broadway, Los Angeles 90014.

Recordkeeping Requirement Update for Employers



Jean Powers
Labor Statistics and Research

Every employer and every State and local public agency in California must keep CAL/OSHA records on occupational injuries and illnesses except those who qualify for the *small employer* exemption, discussed below, and a relatively small number of employers covered by the Federal Metal and Nonmetallic Mine Safety Act.

An employer is exempt from maintaining CAL/OSHA records on occupational injuries and illnesses if he had no more than seven employees at any one time in the preceding calendar year. In determining whether an employer is entitled to the small employer recordkeeping exemption, *all* employees in any of the employer's establishments anywhere in the country must be included. In applying the small employer exemption to a public agency, it is necessary that all employees in its jurisdiction, full or part-time, be counted.

What Records Must An Employer Keep

For a private employer, the records required under the California Occupational Safety and Health Act are essentially the same as those required under the Federal Act.

A private employer must keep at each of his physical locations a **Log of Occupational Injuries and Illnesses** (OSHA Form 100) or its equivalent on which each occupational injury or illness is entered.

In addition, a private employer must keep a **Supplementary Record** giving details on each individual injury or illness entered on the Log. An employer may use OSHA Form 101 for maintaining the Supplementary Record or any similar form that provides all the information required on the OSHA 101. California employers will probably choose to retain a copy of the **Employer's Report of Occupational Injury or Illness** (Form 5020), which is used for reporting workmen's compensation cases, instead of OSHA Form 101.

Following the close of the 1974 calendar year, each private employer must add the entries on the log in each establishment and transfer the totals to an OSHA Form 102, **Summary, Occupational Injuries and Illnesses**, which shall be posted for viewing by employees from February 1 through March 1 of 1975.

For public agencies recordkeeping requirements became effective July 1, 1974. They are to enter the record of their occupational injuries and illnesses on CAL/OSHA Form 100A, **Public Agency Log of Occupational Injury or Illness** and summarize their experience at the close of the year on CAL/OSHA Form 102A, **Public Agency Summary of Occupational Injuries and Illnesses**. The initial summary posted by public agencies in February 1975 will cover six months only. Subsequent summaries will cover the entire calendar year. Public agencies insured with the State Compensation Insurance Fund may use State Fund Form 67, **Employer's Report of Occupational Injury or Illness** as the supplementary record.

What Occupational Injuries Or Illnesses Must Be Recorded

Under CAL/OSHA, **recordable** occupational injuries and illnesses are any cases which involve:

1. **Occupational fatalities** (deaths), regardless of the time between injury and death, or the length of the illness;
2. **Occupational illnesses**;
3. **Occupational injuries** which result in **one or more** of the following: lost workdays, loss of consciousness, restriction of work or motion, termination of employment, transfer to another job, or medical treatment other than **first aid**.

First Aid

A California employer must complete an **Employer's Report of Occupational Injury or Illness** for his workmen's compensation insurance company in **every** case in which an employee suffers a work injury and is seen by a doctor; however, not all of these cases are to be recorded on the CAL/OSHA log. Minor injuries seen by a doctor constitute only first aid by CAL/OSHA definition. Whether a case should or should not be entered on the log must be decided individually in terms of whether or not it meets the CAL/OSHA definition of recordability.

For recording cases on CAL/OSHA forms, one-time treatment of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care, are to be considered **first aid cases**, even though treatment is administered by a physician or a nurse. Such cases are **not** recordable. The employer may wish to keep a copy of the Employer's Report of Occupational Injury or Illness in his file of supplementary records, but he need not assign it an OSHA case number. A follow-up visit to the doctor for the purpose of observation or for changing the bandage on a minor wound does not change the case from one involving only first aid to one involving medical treatment.

Although the final decision as to whether a case is recordable rests with the employer, some guidelines may help:

- Any wound that requires sutures (stitches) or surgical debridement (cutting away dead skin) should be considered an injury requiring medical treatment. Bandaging a wound or applying an antiseptic without suturing may be considered first aid. Prescriptions given solely for relief of pain on the initial visit need not be considered medical treatment.
- Removal of a foreign body or bodies from the eye by irrigation may be construed as first aid.
- The application of elastic bandages or hot or cold compresses on the first visit to the doctor need not be recorded, but, if a strain or sprain restricts the injured person's motion or his ability to perform

(Continued on page 8, col. 1)

(Continued from page 7)

all his usual duties, the injury should be recorded.

- Tetanus shots, either initial or booster shots, or X-rays which are negative are not to be considered medical treatment unless the other services rendered would be classed as medical treatment.

- Treatment of most first degree burns are considered to fall within the first aid category, although second and third degree burns generally would be recordable.

WHERE TO OBTAIN FORMS AND RECORDKEEPING INFORMATION

For questions on CAL/OSHA recordkeeping or for additional copies of the Log, the Annual Summary, the Public Agency Log, or the Public Agency Summary, get in touch with either office of the California Division of Labor Statistics and Research:

Northern California

Division of Labor Statistics and Research

P.O. Box 603

San Francisco, California 94101

Private employers call: (415) 557-3317

Public agencies call: (415) 557-1088

Southern California

Division of Labor Statistics and Research

3460 Wilshire Boulevard

Los Angeles, California 90010

All employers call: (213) 388-2257

Supplies of the Employer's Report of Occupational Injury or Illness may be obtained from the employer's workmen's compensation insurance company.

With questions on CAL/OSHA recordkeeping, contact the nearest office of the Division of Labor Statistics and Research.

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new address.

△86275—501 7-74 26M

OFFICES OF THE DIVISION OF INDUSTRIAL SAFETY

Main Offices

San Francisco	455 Golden Gate Ave. 94102	415-557-1946
Los Angeles	3460 Wilshire Blvd. 90010	213-381-1332

Regional Offices

Fresno	2550 Mariposa St. 93721	209-488-5274
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-5695
Los Angeles (North)	8155 Van Nuys Blvd. 91402	213-988-6141
Sacramento	2422 Arden Way 95825	916-445-0668
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-1677

District Offices

Bakersfield	225A Chester Ave. 93301	805-324-6437
Concord	1070 Concord Ave. 94520	415-676-5333
El Monte	3415 Fletcher Ave. 91731	213-572-6960
Fresno	2550 Mariposa St. 93721	209-488-5302
Long Beach	230 E. Fourth St. 90802	213-432-8443
Los Angeles (South)	3460 Wilshire Blvd. 90010	213-381-3861
Modesto	1800 Coffee Rd. 95355	209-529-7751
Oakland	1111 Jackson St. 94607	415-464-0660
Panorama City	8155 Van Nuys Blvd. 91402	213-782-1800
Redding	1421 Court St. 96001	916-246-1621
Sacramento	2422 Arden Way 95825	916-445-5818
Salinas	21 W. Laurel Dr. 93901	408-449-7235
San Bernardino	303 W. Third St. 92401	714-383-4321
San Diego	1309 State St. 92101	714-236-7325
San Francisco	1540 Market St. 94102	415-557-0660
San Jose	888 No. First St. 95112	408-277-1260
San Mateo	2555 Flores St. 94403	415-573-1718
Santa Ana	28 Civic Center Plaza 92701	714-558-4141
Santa Barbara	3704 State St. 93105	805-682-2578
Santa Rosa	750 Mendocino Ave. 95401	707-542-8802
Stockton	31 E. Channel St. 95202	209-948-7762
Vernon	2833 Leonis Blvd. 90058	213-589-5848

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Chico	555 Rio Linda Ave. 95926	916-345-7131
Eureka	619 Second St. 95501	707-442-5748
Ukiah	264 E. Smith St. 95482	707-462-8850
Ventura	5740 Raiston St. 93003	805-644-8219

Thirteen Californians died in fork lift accidents in 1972.

"California Work Injuries, 1972"

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CHIEFLY SPEAKING

There seems to be some confusion about the function of the Division's consultation staff and their duties. There is a definite separation between the consultant and the compliance engineers. Their duties do not overlap.

The duties of the consultants are numerous and distinct from those of the compliance staff. They train employers and employee groups in safe work practices by offering them pertinent information concerning their safety problems in the form of pamphlets, films, posters, and demonstrations.

Upon request they consult with employers on specific safety problems. Please keep in mind that even if the problem involves a violation, the employers will not be cited by the consultant. Only if the problem presents an imminent hazard will action be taken by the consultant.

If an employer has questions about the safety of a piece of equipment or process, or wishes to learn if it meets State safety standards, the staff will be glad to talk with him.

The staff will help employers establish safety programs by providing information regarding effective program and motivation measures, and lectures.

If an employee group, union or otherwise, has a question regarding the interpretation of a safety order and its applicability to their place of employment, the consultation staff will be happy to give them an answer.



Richard Wilkins

It also organizes and assists in safety conferences and gives talks and speeches to groups interested in safety.

The consultation staff does not make wall-to-wall inspections. It does not issue citations. Only if a situation poses an immediate risk of serious injury or death will it require a violation to be corrected on the spot or terminate the operation. The consultation staff's records are not available to the compliance staff. The consultants do not discuss cases with compliance engineers or in any way "tip them off" to violations incidentally discovered.

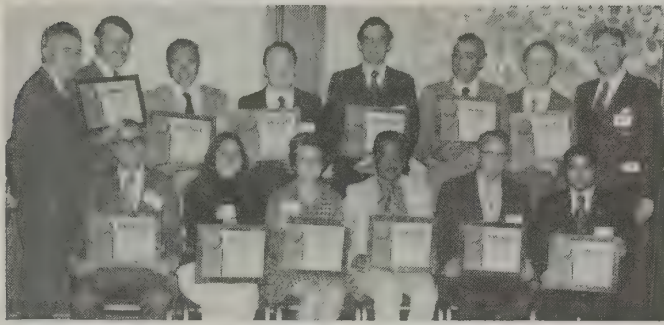
As you can see, its function is primarily of a service nature. It does not share the enforcement aspect of the compliance staff. Consequently, employers and employees should feel free to call for consultation without fear of repercussions from the compliance section.

The dichotomy of these two factions of the Division of Industrial Safety is strictly maintained. Both are integral parts of California's total plan for safe work places under OSHA. However, each handles a different aspect of the problem.

ON THE COVER

Sides of bacon are fed onto a conveyor which leads them through a slicing machine. Razor sharp knives and various slicing and grinding machines are tools of the trade for meat packing and processing employees. For the story, see page six.

SAFETY CONTEST WINNERS RECEIVE AWARDS



Presentation of safety awards to the first place winners in the California Cities Employee Safety Contest.

Awards were presented recently to the winners of the California Cities Employee Safety Contest and the California County Employee Safety Contest.

The California Cities Employee Safety Contest was sponsored by the League of California Cities and the State Compensation Insurance Fund. The County Supervisors Association of California and the State Compensation Insurance Fund sponsored the California County Employee Safety Contest.

The cities and counties with the lowest rate of on-the-job disabling injuries to employees during the year ending June 30, 1973, received plaques commemorating their achievement.

Winners of the California Cities Employee Contest were:

First Place—Cudahy, Yorba Linda, Carpinteria, Norco, Fairfield, Arcata, Cerritos, Pleasanton, Hanford, Downey, Palo Alto, Sacramento

Second Place—Los Altos Hills, Rolling Hills Estates, King City, Arroyo Grande, Pinole, Norwalk, Banning, Woodland, Barstow, Ontario, Stockton, San Diego

Third Place—Tulelake, Live Oak, Corning, Camarillo, Larkspur, Los Gatos, Newark, Livermore, Lompoc, Escondido, Huntington Beach, Long Beach

Winners of the California County Employee Safety Contest were:

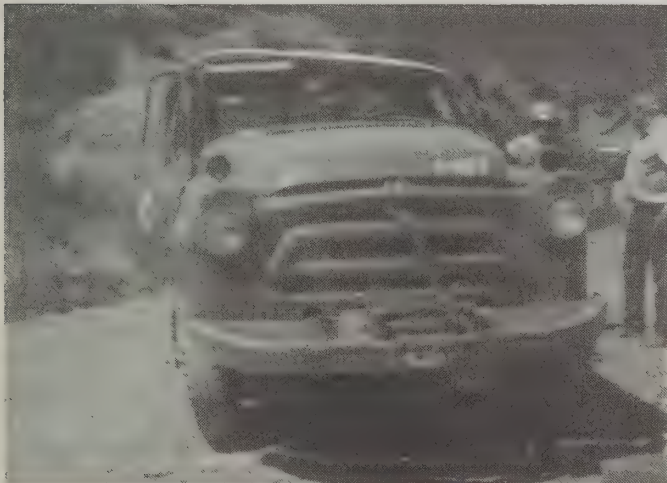
First Place—Alpine, Siskiyou, Placer, Santa Cruz, San Joaquin, Santa Clara

Second Place—Modoc, Tehama, Imperial, Humboldt, Ventura, San Diego

Third Place—Mariposa, Lassen, Mendocino, Tulare, Monterey, Kern

Mr. Henzi, Public Agency Services Officer of the State Compensation Insurance Fund, presented the awards. He congratulated representatives of the participants on their safety activities designed to reduce on-the-job injuries.

Roll Bar Increases Truck Cab Safety



The Department of Forestry truck after the test.

Division of Forestry firetrucks may soon be sporting an additional roll bar. Roll bars were installed at the back of the firetrucks in 1969. They were designed to protect the passengers in the rear area in case the truck overturned. The new roll bar has been suggested as a safety device to protect the occupants of the cab. An accident in which a driver was crushed when his truck rolled prompted a study into the practicality of adding a second bar.

Tests of the new roll bar were conducted last summer at the Fire Academy's four wheel driving course near Lake Comanche. Division of Forestry equipment engineers Walt Harkness and Wilbur Zimdars directed the tests.

The roll bar was made of standard two inch by .125 inch wall square tubing and was attached directly behind the cab of a number four firetruck. In order to simulate a fully manned and loaded truck, water and fuel tanks on the vehicle were filled with water, and sandbags were placed in the compartments and cab. The unit weighed 13,050 pounds after loading; 5,680 pounds on the front axle and 7,370 pounds on the rear axle.

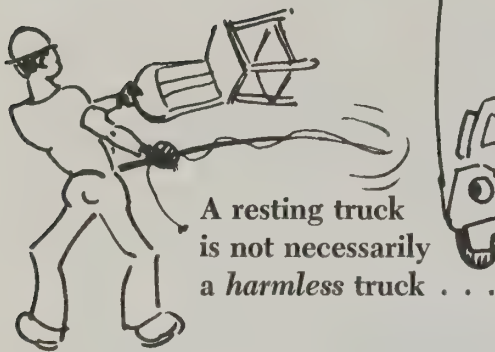
The truck was pushed down a twenty foot cliff by a D-7 bulldozer. It made one and three-fourths turns down the cliff, landing on the driver's side.

After the dust cleared, it became apparent that the roll bar had accomplished its purpose. The cab was minimally crushed at the rear and was depressed several inches near the windshield. There remained adequate head space within the cab for its occupants. Engineer Harkness was pleased with the test results. "The supplemental cab brace," he stated, "did an adequate job of restricting cab intrusion. We are looking forward to adding it to the majority of our engines."

Excluding installation, the cost of the bar is expected to be from \$50. to \$75. per unit. It can be installed on some Division of Forestry firetrucks without major modification to the trucks.

The new roll bar should help to eliminate serious injuries and fatalities caused by cab intrusion when a fire-truck overturns.

trucks at rest



There are 7667 on-the-job disabling injuries reported each year in California involving motor trucks.

The trucking industry's disabling injury rate of nearly 35 per 1,000 employees is one of the highest in California.

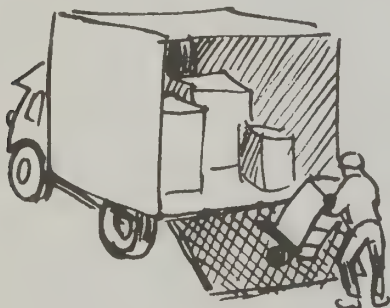
Only 13% of accidents involving trucks on-the-job and their loading and unloading occur while the truck is in motion—indicating that the vast majority of accidents happen when the truck is stationary.

What are the hazards which cause these accidents and how can we reduce them?

Accidents could frequently be avoided if the design of the vehicle were modified. Poor maintenance of the work area and vehicle are at fault for many more. Insufficient training of employees is a third cause of accidents.

Accidents involving trucks on-the-job fall into the following categories:

- 30% are due to strains and over exertion
- 26% are due to falls and slips
- 22% are caused by an employee striking an object or being struck by an object
- 9% occur under miscellaneous circumstances
- 13% occur when the vehicle is in motion



SAFE LOADING AND UNLOADING

Improvements on the vehicle will prevent injuries during loading and unloading.

- Use mechanically operated tailgates or adjustable height trailers.
- Tailgates should be bottom-hinged and side doors surfaced with anti-slip material when they are used as ramps.
- Securely fasten hoist booms.

- There should be skylights in closed trucks and trailers.
- Stake racks on flat beds should be designed and maintained for easy removal.

Appropriate equipment and working conditions will prevent injuries during loading and unloading.

- Use material handling devices such as forklifts, conveyors, and hoists.
- Adequately design and maintain dock areas.
- Dock plates should be mechanically adjustable.
- Dock plates should be light weight with securing devices and consideration given to anti-slip surfacing.
- When top-loading there should be access platforms to tops of bulk loading vehicles.
- Enforce good housekeeping on docks.



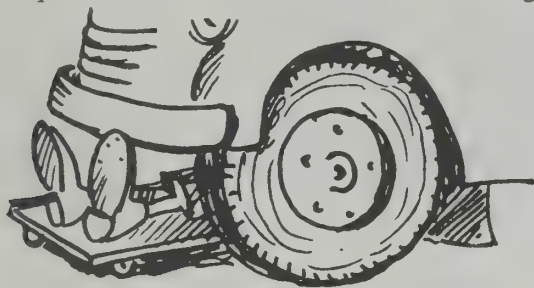
GETTING ON AND OFF VEHICLES

Modifications on the vehicle will prevent injuries while boarding and debording.

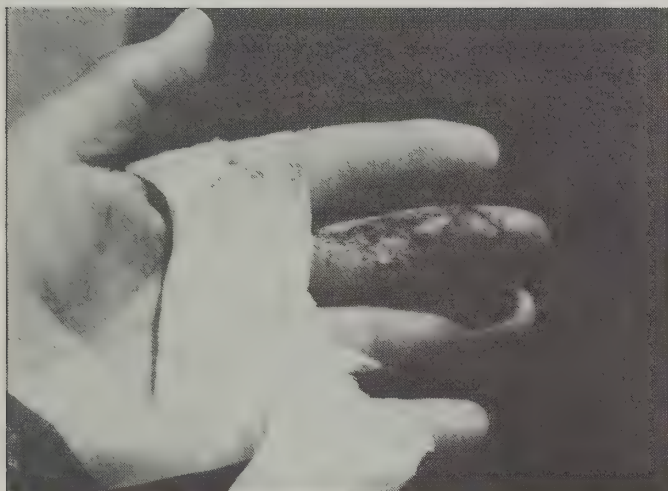
- Provide suitable steps, stirrups, ladders, and hand-holds for safe access to cabs, fifth wheel decks, and beds.
- Use anti-slip surfacing on stepping areas.
- Arrange tools on maintenance and service trucks to reduce frequency of getting on and off the vehicle.
- Give consideration to equipment design that will provide a safe means of getting on and off the vehicle.

Shop Injuries Might Be Prevented By The Use Of—

- Tire inflation cages
- Mechanical lifts and chain hoists
- Proper tools for the job which are maintained in a safe condition
- Safe blocking methods of wheels, tilt cabs, and dump truck beds
- "Don't Start or Don't Move" placard clipped on steering wheel when work is performed on or under vehicle
- Portable scaffolds for work on high equipment
- Adequate lighting and good housekeeping methods
- Necessary personal protective safety devices
- Adequate ventilation to control motor exhaust gases



Airless Paint Spray Gun Potential Safety Hazard



Injury caused by airless paint spray gun.

Airless paint spray guns can be a valuable aid to painters. However, because they emit paint at tremendous pressure, they are a potential safety hazard and must be used with caution.

As an example, a painter was cleaning his airless paint spray gun after completing a job. As he wiped the barrel, his finger rested on the opening. Accidentally, he hit the trigger and the gun went off. Paint at the pressure of 2000 pounds per square inch blasted a small hole in his finger. Balloon like, the finger swelled larger and larger as paint was forced into the hole.

At the hospital, a doctor had to cut the finger its length to scrape paint from the wound. A cast was placed on the hand. The painter was unable to work for five months. His other fingers in the cast degenerated

SAFE WORK PROCEDURES AND EDUCATION

For Everyone's Safety, Why Not?—

- Conduct regular safety meetings and inspections.
- Use visual-aid material.
- Encourage employee safety suggestions.
- Recognize safety accomplishments.
- Supervise work procedures and safety rule compliance.
- Provide suitable job instruction and training for employees, including—

- Methods of coupling trailers to avoid hand injuries.
- How to fasten loads securely.
- How to properly loosen radiator cap.

Thoroughly investigate accidents to determine cause and remedial measures.

FINALLY

Why not establish an equipment purchasing policy to give full consideration to safety features.

from disuse, and it was many months after the cast was removed before full use of the hand returned. In similar accidents, the limb that has been perforated by the force of the paint must often be amputated, so in a sense, the painter was lucky.

This accident could have been prevented. The painter was using a gun which did not have a safety lock on the trigger. If it had a safety lock and if the painter had used it, chances are the gun would not have accidentally gone off. A safety lock should have been set whenever the gun was not being used.

The painter did not know the gun was emitting paint at so high a pressure. The gun had a pressure gauge but it was covered with paint and unreadable. If the painter had been more familiar with his equipment and had maintained it properly, perhaps he would have been more cautious and the accident would not have happened.

Anyone using an airless paint spray gun should read all instructions which apply to the model. Different models are designed for different purposes.

As an illustration, a painter was using an airless paint spray gun to spread lacquer on a wood panel. The spray gun receptacle exploded, killing the painter. His spray gun was not designed to be used with lacquer. It did not have an adequate spark arrester on the motor. The spray gun was made to be used with water base paints only. Operating on 110 volt current, the motor issued a spark which ignited the explosive fumes in the paint container. The accident could have been prevented if the painter had read the instructions about the gun and followed them.

Accidents with all types of airless spray guns are often preventable. The guns should have safety locks on the trigger, be clean and well maintained, and come with appropriate instructions and warnings. Only if the user practices caution, follows the instructions, and heeds the warnings can the airless spray gun be used with safety.

1. When employees are working on small jobs at many sites for short periods of time, where does the employer post the CAL/OSHA poster?

ANSWER: The CAL/OSHA poster should be posted at the place where the employees assemble in the morning or afternoon or where they receive their pay check.

2. If employees are excavating a trench, does an employer have to display a CAL/OSHA poster on the trench wall?

ANSWER: No.

3. Can an employer reproduce the CAL/OSHA poster?

ANSWER: Any person can reproduce the CAL/OSHA poster as long as the reproduction is an exact copy of the poster including size, and text. The CAL/OSHA poster is a legal document and cannot be altered in any way.

4. Must an employer post both the Spanish and English version of the CAL/OSHA poster if he has only English speaking employees or only Spanish speaking employees?

ANSWER: Both the Spanish and English version of the CAL/OSHA poster must be posted.

5. Can an employer reproduce the CAL/OSHA poster adding another language?

ANSWER: Yes, as long as the official CAL/OSHA Poster is posted a supplement can be posted in another language. No changes can be made in the text however.

6. Must both the Federal and CAL/OSHA posters be displayed?

ANSWER: No. In California only the CAL/OSHA poster must be posted.

7. May employers request dry run inspections from the Division in which penalties will not be issued?

ANSWER: No, but any employer can request a consultation regarding a specific safety problem in his plant. For consultation service phone: San Francisco, (415) 557-0600 or Los Angeles, (213) 388-9573, or write Division of Industrial Safety, Consultant Service, State of California, 1540 Market Street, San Francisco 94102 or Division of Industrial Safety, Consultant Service, State of California, 3460 Wilshire Blvd., Los Angeles 90010.

CAL/OSHA QUESTIONS, PLEASE

Please send questions concerning CAL/OSHA to:

Division of Industrial Safety
Education and Research Unit
455 Golden Gate Ave.
San Francisco, Calif. 94102

SAFETY IN THE



Boning meat.

Meat packers and processors rigorously guard the wholesomeness of their product but have a long way to go in establishing a satisfactory job safety record. Most injuries to meat workers involve:

- wet or fat-slick work surfaces
- human lifting, sectioning, or moving of heavy and awkward weights
- use of power tools in wet or damp atmospheres and in close, crowded quarters to cut, saw, chop, or grind
- razor-sharp hand knives to make fine cuts wherever power tools cannot be used

These are the problem areas that must be controlled for the safety of workers. The question is, "HOW?"

THE FIRST STEP is training in safety. Make safety training a must and adapt that training to each specialty job. Never send new workers or apprentices on a job until they have such training. And don't forget to retrain older workers at regular intervals in accepted safety practices for their specialties.

THE SECOND STEP is to minimize the major hazards built into butchering, packing, and processing meat.

—**HAVE AN EFFECTIVE HOUSEKEEPING PROGRAM** for every work area. Wet and fat-slick work surfaces cause slips and falls. Clean and mop frequently. Use non-slip mats, grates, or cleats whenever slipping is a danger. High-friction surfaces in all work areas also help. Wearing non-slip safety boots or shoes should be required of all meat industry workers.

—**DISABLING INJURIES DUE TO STRAINS OR OVEREXERTION** can be reduced by training all workers in correct lifting techniques. **ALWAYS BEND AND LIFT WITH THE LEGS. NEVER STOOP TO LIFT** if the item is on the floor or at a level below the waist. For all lifting, **IF YOU CAN'T LIFT SLOWLY, YOU CAN'T LIFT SAFELY.** Wherever heavy lifting is required, many firms have adapted special mechanical

MEAT PROCESSING INDUSTRY

lifters to the work station and require that they be used. The special lifting team of two or more workers is another widely used and successful method to reduce injuries due to lifting or overexertion.

—ALL ELECTRICALLY POWERED MACHINES MUST BE GROUNDED. Because of the prevalence of wet floors and working surfaces and because workers may have wet or damp hands, grounding is possible only if the plant's wiring system that supplies power to outlets is itself correctly grounded. Before



Chopping poultry.

cleaning or maintenance of any electrical tool, lock-out the power source. On a stationary or fixed machine, lock the hand lever of the switch box in the "OFF" position and post a warning sign. For portable equipment, disconnect the power cord before any cleaning or maintenance is begun.

—ALL ELECTRICALLY POWERED MACHINES MUST BE GUARDED at the point of operation. The guard on a meat grinder, for example, must prevent a hand from touching the worm. The steak tenderizer must have an elongated neck so that the operator's fingers cannot reach the spiked rolls, and its cover must be interlocked. The cover of a meat mixer must also be interlocked when in an operating position. If power grinders do not have permanently fixed shields, then the operator should wear goggles or a face shield.

—The HAND KNIFE IS AN EXTREMELY DANGEROUS TOOL. Some rules for safe use of hand knives may differ according to the special cutting job required. But the basic rules apply to all knife uses:

- Never use a dull knife. If the worker does not know how to sharpen knives correctly, then he should have it done professionally.
- Use only that knife specifically designed for the job at hand; blunt the knife if the sharp end is not needed for a certain job.
- Never walk or move around a work station with an unguarded knife. Knives not in use should be



Employee uses hand knife.

sheathed on the worker's person; special racks or scabbards at the work table or at the work station should be used only with extra caution.

- Use only knives with handle guards (or ring-and-swivel guards to prevent "stabbing" injuries) and non-slip handles. If certain knife movements are awkward or clumsy because of the guards, look for another way to do the job that allows use of the guarded knife.
- Wear personal protective clothing like metal-mesh gloves on the free hand, plastic or metal-mesh stomach guards, and plastic wrist guards and arm guards—these guards, together with the safety helmet or hat, will eliminate many potential injuries.
- All involved workers need thorough training in the safe use of hand knives at a particular work station.

THE THIRD STEP is a program to convince meat industry workers that safe practices do protect them from injury. Two basic essentials must be included:

—Investigate, analyze, and report every accident, whether or not it may result in a disabling injury, for non-injury accidents can teach a great deal about dangerous work practices.

—Involve management and labor in all aspects of a safety program to assure two-way communication about dangerous practices and to encourage cooperation in correcting those practices.



Inspecting poultry

ASBESTOS POSES HEALTH HAZARD



Worker using the industrial vacuum cleaning system.

Richard McGuire
Department of Health

Asbestos is a generic term that applies to a number of naturally occurring, hydrated mineral silicates incombustible in air and separable into fibers. The most widely used in industry is chrysotile (hydrated magnesium silicate) which accounts for 95% of world production. Other common types are amosite and crocidolite.

Under high magnification asbestos fibers resemble fine polished wire or strands of silk. When inhaled, these fibers can produce several debilitating illnesses that develop over a long period of time. Asbestos exposure may lead to asbestosis, to carcinoma of the lungs and digestive tract, and to mesothelioma.

Since the recognition of asbestosis 70 years ago, the disease has been widely studied the world over. Asbestosis, a pneumoconiosis—lung disease caused by dust inhalation—develops around asbestos fibers trapped in the lower bronchioles of the lungs. Scar tissue that forms around the fibers spreads throughout the lungs and pulls it out of shape. The working space for air exchange is reduced; breathing becomes difficult and, in advanced stages, can be disabling. The strain on the heart caused by the lack of oxygen may cause heart failure.

Recent studies indicate that asbestos also may be a potent cancer-producing (carcinogenic) substance. Although most cancers linked to asbestos develop in the lower portion of the lungs where the concentration of the fibers is the heaviest, cancer may also develop in the gastrointestinal tract. The peril of lung cancer due to the combination of asbestos exposure and smoking is especially severe.

In addition, mesothelioma, a rare and rapidly fatal cancer that attacks the membrane lining of the chest cavity, lung, or abdominal cavity, is associated almost exclusively with asbestos exposure.

For these asbestos-related diseases, there is no known treatment; however, if problems are diagnosed early, exposure levels can be reduced and complications treated.

Almost one million tons per year of asbestos are used in the U.S. Approximately 70% of the asbestos is used in the construction industries. Much of the asbestos used

in the construction industry is firmly bonded; i.e., the asbestos is "locked in" such products as floor tiles, asbestos cements, and roofing felts and shingles. The remainder, about 50,000 tons, is in powder form, present in insulation materials, asbestos cement powders, and acoustical products. As expected, these products generate more airborne fibers than the firmly bonded products. The automotive and textile industries are the major non-construction users of asbestos products. These industries utilize asbestos in friction material, such as brake and clutch linings and fire-resistant material like protective clothing and curtains for schools.

Workers in many occupations encounter serious asbestos exposures. Among the establishments most likely to have asbestos risks are those manufacturing or handling asbestos-containing products. In addition, secondary exposures occur to nearby workers when airborne asbestos fibers are generated.

In developing the standard to protect the worker, the criteria is to reduce the risk of disease to an acceptable level. The danger varies depending upon the intensity of asbestos dust, fiber characteristics, individual susceptibility, presence of other pollutants, and the dose response. To achieve these needs, the following standard has been promulgated:

The time-weighted average concentration levels for the 8-hour workday shall not exceed 5 asbestos fibers, longer than 5 micrometers, per cubic centimeter of air. The ceiling or short-time concentration to which employees are exposed shall not exceed 10 fibers per cubic centimeter. The standard further describes the steps to be taken for protection against asbestos dust.

Exposure is to be controlled via:

1. Engineering methods to prevent the escape and spread of floating dust, such as isolation of dust-producing operations and exhaust ventilation systems.
2. Improved work practice; for example, wetting down asbestos before handling to prevent airborne fibers.
3. Caution signs and labeling—all products containing asbestos fibers not permanently bonded or contained must be labeled appropriately.
4. Use of personal protective equipment, such as respirators when engineering controls are not feasible.
5. Housekeeping; i.e., vacuuming garments and workplaces rather than dry-sweeping or blowing with compressed air.
6. Medical surveillance to show whether employees are receiving adequate protection from the dangers of asbestos. Surveillance includes regular physical checkups, careful record keeping for employees working with asbestos and medical evaluation as to when dangerous signs appear.

Thus, the proposed occupational standard complements the ambient workplace exposures with reasonable control procedures that will insure protection for the worker.

Director H. Edward White Visits Asbestos Mine/Mill



Mill building with a covered feed conveyor in foreground.

H. Edward White, Director of the Department of Industrial Relations and Andrew Brozik, Safety Engineer with the Division of Industrial Safety, visited the Pacific Asbestos mine and mill near Copperopolis, California to observe safety conditions. It is the largest combination mill/mine asbestos producer in the United States. Because there are many safety problems involved with asbestos (it is among the top six toxic inhalants on the NIOSH list), Director White wanted to make an on-the-spot survey of possible hazardous conditions in California's asbestos industry.

Director White and Mr. Brozik were greeted by President of Pacific Asbestos, Robert Littlejohn. Prime guide during the day was Mr. Eric Loeb, Director of the Environmental Department of the company.

The mine is about 14 years old and may have a life of another 10 years. There are some 220 employees on the job in both the mill and the mine. The mine is located a short distance from the mill and general offices. It is an open pit mine. The method of mining is a multi-benching system which provides safe ground control.

Serpentine, a rock containing asbestos fiber, is drilled, blasted, loaded into trucks, and hauled to a crushing and screening plant (preparation plant). The material is then conveyed to the mill by several conveyor belts. The asbestos is processed through horizontal and vertical kilns, screens, and sifters. Vibrating screens separate the fiber from the rock. An air suction hood picks up the light fiber. The heavier rock drops below.

Asbestos fiber is graded 1 through 7 for quality. Number 1 fiber is the longest and best. Number 7 is the shortest and lowest in quality. Number 7 asbestos fiber costs about \$40 a ton. Number 1 approaches \$200. Price is essentially set by the Canadian asbestos operation which produces 95% of the free world asbestos. Canadian operations are centered in Quebec, Canada.

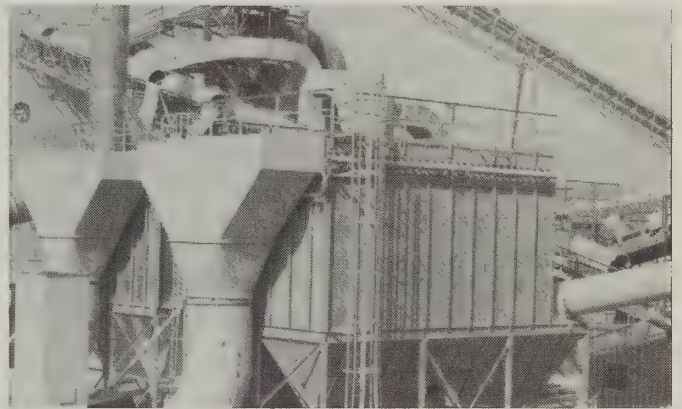
Director White noted that attention is given to environmental health and safety practices in the mill. Control of asbestos dust is essential to good health and there is dust control equipment throughout the seven story mill. Employees are required to wear approved respiratory equipment when they are occasionally exposed to asbestos fibers exceeding the threshold limit value. In the

laboratory where testing of the asbestos is done, a large exhaust hood is under construction to protect the workers from fiber exposure.

Director White was told that, interestingly enough, the areas that would seem to be the most hazardous from the dust point of view seldom are. For instance, where they bag the compressed asbestos there was evidence of much fiber on the floor but not in the breathing zones of the workers.

Periodically, tests are conducted of dust content. Certain employees are chosen to wear a unit which sucks in air samples for later analysis under the microscope.

Blasting occurs two or three times a week. Pacific Asbestos alerts the surrounding countryside of pending blasts. Balloons are sent aloft to check the wind direction. Director White observed a blast from the rim of the mine.



New bag houses installed for in-plant dust control as well as air pollution control.

The blast area is prepared by drilling a number of vertical holes approximately 30 feet deep. These holes are loaded with ammonium nitrate blasting agent and a booster for ignition by electricity. The wires are shorted until ready for blasting to avoid accidental discharge through static electricity or stray currents. When the area is ready for the shot, two blasts of the siren occur and this is the signal that in five minutes the shot will go off. After the explosion, the superintendent goes into the area to be certain all went well. He then returns to the control booth and sounds the all clear siren.

During the tour Director White discussed the function of the Division of Industrial Safety with individual employees and with small groups of workers. The benefits of the tour were twofold. The Director gained a better understanding of asbestos mining and milling. His personal appearance at a mining operation, the first any director has ever made, reflected good will to the operators. Director White and Mr. Brozik felt that more than ever, the operators would be concerned with employee safety.

(((NOISE CAN HURT)))

You can lose your hearing by a sudden blast of sound, an eroding disease, puncture of an eardrum, or just plain old noise where you work. It isn't really just plain old noise, either. It is a special hazard that might affect your life.

With your hearing impaired you will miss the pleasure of the voices of those you love. You will miss the joy of listening to good music, the thrill of a vibrant stage performance, the relaxation of a good radio or television show.

BEWARE THE BEATING ON YOUR EARS

Over the years, constant exposure to excessive noise where you work will diminish your hearing. It is a slow process, and you might not know that it is happening until it is too late.

Would you rather wear a simple earplug now or an expensive hearing aid later? Some people fear putting on weight and count their calories. If you are interested in preventing hearing loss, count your decibels.

WHAT IS A DECIBEL?

The term decibel is a measure of sound. "Deci" means ten; "bel" is a unit of sound measurement named for Alexander Graham Bell, the physicist. There you are—decibel, one-tenth of a bel; abbreviated dB.

Sound is made of vibrating air waves that vary in frequency and pressure. Frequency is measured in cycles per second and sound pressure is measured in decibels. There are several scales used on sound level meters. The risk of damage to hearing is measured using what is called the "A" scale on a sound level meter. This scale filters out some of the less damaging low frequency noise. Unlike the other scales, a single meter reading measures the risk of hearing damage no matter what frequency the noise is. Decibels measured on the A scale are referred to as dBA.

FROM RUSTLE TO ROAR

The rustle of leaves either cannot be heard or can reach the threshold of hearing at about 25dBA, whispering falls into the 25-45 dBA bracket. The average office sounds, ordinary conversation too, produce about 45-65 dBA. A noisy office, average street noise, and average radio sounds create 65-85 dBA.

Loud street noises, subway cars, police whistles, automobiles, lathes, and looms show 85 to 100 dBA on a sound level meter. Planers, routers, circular saws, and some special hammers create a clatter of about 115 to 130 dBA. A jet engine at 75 feet puts out a whine to the extent of possible pain to the ears. Decibel count of this hazard is about 135.

In the mathematics of noise measurement, because of logarithmic progression, it is interesting to note that doubling the intensity of the noise results in a 3dB increase.

SAFETY ORDERS LIMIT NOISE

Permanent hearing loss is possible after steady exposure to noise over a long period of time. If hearing loss persists six months after removal from a noisy work area, it is considered permanent.

Because hearing loss can result from unreasonable exposure to the clangor in some places of employment, the State of California has Noise Control Safety Orders. These are enforced by Safety Engineers of the Division of Industrial Safety.

The State protects its workers against the environmental danger of industrial noise in several ways. A decibel limit is established and a time limit for exposure is stated that allows the employee to remain in a noisy area twice as loud for half as long—according to a regulated scale. The Safety Orders for noise control require employers to reduce noise at its source by engineering or operational controls when feasible. Employers must provide personal protection equipment when noise reaches certain levels as described in a chart in the Safety Orders.

THE INS AND OUTS OF EARPLUGS AND EARMUFFS

Earplugs, earmuffs and helmets are effective in keeping the decibel count at a safe level. Sometimes a combination of these devices is indicated.

In an environment where a 90 dBA noise prevails, earplugs or earmuffs can reduce the din to a tolerable level. Ordinary speech and warning signals can be heard with these devices.

Earplugs block the ear canal to reduce the force of sound waves to the eardrum. They require a snug fit to be effective. A short period of adjustment to their use may be necessary—similar to becoming adjusted to wearing eye glasses. Where the ear canal cannot accommodate earplugs, earmuffs are to be used.

The surface of earplugs must be in contact with the skin's surface. They should be fitted by a properly trained person.

It is easy to have clean, effective earplugs. A plug which cannot be sanitized should be used only once. Washing with soap and water will keep an ordinary plastic type plug clean. These should last about a year. When they become hard and brittle, replace them. Properly designed earplugs cannot enter the ear canal far enough to do any damage.

Leave absorbent cotton in the first aid kit. It is of little or no value in the ear against blare or rumble.

The employer must provide ear protection equipment and replace it when necessary; the employee shall use the equipment and keep it in sanitary and efficient condition.

Copies of the Noise Control Safety Orders are available free of charge from the Occupational Health Section of the Department of Health, c/o Division of Industrial Safety, P.O. Box 603, San Francisco, California 94101.

TAMING THE ROAR

Noise can be controlled at its source by substituting quieter procedures for those which make noise. For example, welding can sometimes replace riveting and belts can sometimes be used instead of gears to transmit power.

Noisy machines can be moved to a place where only a few people work and the area can be noise-insulated with sound absorbing materials like acoustical tile, special plasters, or glass wool on walls and ceilings. Closed doors also help suppress noise.

Machines mounted properly on resilient materials are quieter because the noise source is separated from the floor, which sometimes acts as a sounding board.

TIME OUT FOR DEAFNESS

Short term exposure to noise may produce temporary loss of hearing. This is called Temporary Threshold Shift. With frequent, repeated exposure, the loss will become permanent. Then it is called Permanent Threshold Shift.

STATE EXPERTS CAN HELP YOU

Some of the Industrial hygiene engineers of the Occupational Health Section of the Department of Health are specialists trained in evaluating noise problems in places of employment. Consultation with them by labor and management concerned with noise problem is part of the service available from the CAL/OSHA program.

WHAT DO YOU HEAR?

As you grow older, you lose hearing acuity in the higher frequencies. This condition is called presbycusis, a fancy tag for "older hearing." But there is no use rushing the situation by unnecessary exposure to noise.

How do you know when the noise is too much for the safety of your hearing? If you usually have to shout to a fellow worker at arm's length, there probably is too much noise around you.

To determine hearing loss possibly resulting from excessive industrial noise exposure, baseline audiometric tests are conducted before men go to work in noisy areas. Hearing is measured again at least once a year to check the effectiveness of noise control efforts.

HEARING LOSS CAN BE PREVENTED

All in all, hearing protection is readily possible. Noise that may cause deafness or impair hearing can be lessened. Even with corrective engineering to cut down the racket of machines, some workers may still need personal protection such as earplugs or earmuffs. By one method or the other, hearing loss from industrial noise can be prevented.

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new address.

Division Engineers Killed

An auto accident on April 17 claimed the lives of Hufford Allen and William Merritt, Division of Industrial Safety engineers based in San Bernardino. They were killed while traveling in Mr. Allen's private car on State business.

Mr. Allen, age 62, was a safety engineer with the State since 1959. He was a graduate of New York University.

Mr. Merritt, age 56, had been with the Division only since March 15, 1974. Previously, he had worked for the State Department of Housing and Community Standards.

The loss of Huff Allen and Bill Merritt is deeply felt by the whole Division.

WORK INJURIES PUBLICATIONS

The following publications are available from Division of Labor Statistics and Research, P.O. Box 603, San Francisco 94101

- California Work Injuries, 1971..... February 1973
- Electrical Injuries in California, 1971 (Issued jointly with the Division of Industrial Safety) October 1972
- Work Injuries in Roofing and Sheet Metal Work July 1972
- Work Injuries in Mobile Home and Trailer Coach Manufacturing—California March 1972
- Work Fatalities in the Forest Products Industries—California March 1972
- Work Injuries in the Meat Products Industry—California October 1971
- Work Injuries in California Public Schools May 1971
- Work Injuries in California Quarterly
Recent reports have featured articles on:
 - Work Injuries to Plumbers in the Construction Industry
 - Work Injuries Involving Forklifts
 - Work Injuries to Employees of Painting Contractors
 - Work Injuries in Tunnel Construction

Third Annual Session to Study the Drinking Driver

San Diego's third annual Summer School of Alcohol Studies to be held August 26-30, 1974 will concentrate on the recognition, identification, and lifestyle modification of problem-drinking drivers. For a brochure, write to Karen Lockwood, Director of Alcohol Studies, University of California Extension, P.O. Box 109, La Jolla, Ca. 92037. Phone (714) 453-2000, ext. 2867.



THE BIG TARGET

ATTITUDE CONTROL

Jim Koonz
Director of Engineering
Zenith National Insurance Company

While insurance companies, industry in general, and even the big guns of OSHA are aiming at the correction of physical deficiencies in America's work places—the avowed purpose of protecting the workers from industrial injuries—it appears most of the effort is being pointed at the outer edges of the real problem.

Statistics show, that while approximately 2% of industrial injuries might be caused by so called "Acts of God", only about 10% can be traced directly to physical problems within the work area. This leaves a whopping 88% of this national plague resulting in whole or in part from the unsafe acts of employees. Acts usually caused by one of two conditions; either inadequate training or poor employee attitude.

If human factors or worker attitude is to be influenced—to reduce accident incidents in industry—the objective remains basically the same as it has always been: to inspire the individual to self discipline. Every acceptable means must be applied to influence him with first, an awareness of and secondly, a self protective attitude towards all of the hazards constantly about him. Experience shows that this requires training, more training and more sophisticated training. He must be subjected to every logical and acceptable form of propaganda available and compatible with job requirements. A continuous effort is required to induce any individual to make a proper appraisal of the possible consequences of his proposed action. A sub-conscious translation of these consequences, into units of measure readily appreciated by the person involved, enhances his evaluation of the potential hazard and promotes a greater effort in producing a change toward safer actions.

One method found effective in accomplishing this is the concentration of effort on one facet of safety. Effort applied will be more beneficial to the overall safety program of attitude control, through generation of safety awareness, providing it is not spread too thin by being overly diverse in aim. It would seem the ideal program should stress that facet of safety which affects the greatest percentage of employees. In many instances this might be eye protection. Using this as an example, let us say that a particular plant institutes an eye safety pro-

gram with a two-fold purpose in mind. First, the correction of an eye problem (the concern has a large percentage of chip producing or high eye hazard operations) and second, the control of poor worker attitude which prevails in the same area. A typical program very likely to produce the desired results would include:

1. Publication of accident facts (history of injuries in the plant, including major and minor injuries as well as near misses), along with the dollar value of lost time to the company and to the employee plus medical and compensation costs. These dollar values might be translated into units of production required to net an equal amount. As an example, one year's injury losses, including hidden cost factors, might equal \$12,000. With a profit structure of \$.50 net profit per unit, a chair manufacturer would have to produce 24,000 additional chairs per year, just to break even with the injury costs. This can be very meaningful to an employee who installs cushions in chairs for such a company, as he recognizes the enormity of the problem through translation into units with which he personally works.
2. Training—this should include exhibition of movies on eye protection problems, control methods and appliances in conjunction with a concerted eye safety poster program.
3. Management involvement—supervision must lead the way in support of the program by good example and by firm and impartial enforcement practices.
4. Supply—eye protection appliances supplied to the employees must be top quality equipment, comfortable and effective. A survey made by one or more companies dealing in these items usually will provide adequate information and indicate the most appropriate source of supply. Many companies will offer individual fittings to each employee to assure maximum comfort and also handle any prescription purchases which might be required.

To be really effective, this program should be a 100%, door to door, mandatory program. Every person, regardless of position or occupation, without exception, should be required to wear approved type eye protection while in this plant or building.

The possible addition of an incentive program can be very helpful. This may take many forms, such as cash or books of trading stamps presented for accident free work periods or the very effective "NIGHT OUT", where the family of the winner of a safety competition is treated to an evening out, including dinner, etc. It has been demonstrated that including the family of the winning employee multiplies the effect of any incentive program.

Worker attitude may never be fully controlled. We may not even desire such control, but it can be influenced. The closer we look at the problem the more complex it seems to be. The key of course, is in the hands of management. Recognition of the true problem along with its hidden factors, honest evaluation of the need and intelligent planning of corrective action, combined with a determination bred of true humanitarian concern and nurtured by monetary consideration, must ultimately lead to a meaningful success story. A real bull's eye on that big 88%—an area, believed by many to be untouchable—**THAT BIG TARGET, WORKER ATTITUDE.**

The Assessment of Civil Penalties Under Provisions of the California Occupational Safety and Health Act of 1973

Penalties for violations of the Safety Orders (safety and health standards) are assessed by the District Managers of the Division of Industrial Safety and checked by one of six assessors, each responsible for reviewing the work of about four managers. Amounts are rounded down to the next whole dollar during the calculation stages, and final figures adjusted downward to the next lower \$5 value. Assessments are based upon various reports completed by the Division engineer during and following his survey.

On these reports, violations are divided into three basic types—serious violations, nonserious violations and regulatory violations. A serious violation is one that presents substantial probability that death or serious physical harm could result. A nonserious is one which is not serious but has a direct relationship to occupational safety or health of employees. A regulatory violation exists under conditions like failure to post required notices or materials, record keeping failures, etc.

Each nonserious violation is assessed a penalty for *severity* based upon the extent of medical treatment appropriate for the type of injury or illness that would result. If the severity is low the penalty is \$70. If the severity is medium the penalty is \$250. If the severity is high the penalty is \$500. For assessment purposes similar violations of *the same* standard are grouped together and treated as one.

Nonserious penalty amounts are modified by the *extent* (prevalence) of the violation and the *likelihood* that an injury will occur because of it. If the extent is low, 25 percent of the severity penalty is subtracted. If the extent is high, 25 percent is added; medium, no adjustment is made.

If the likelihood is low, 25 percent of the severity penalty is subtracted. If the likelihood is high, 25 percent is added; medium, no adjustment is made. If penalties for ordinary nonserious violations, after this stage of their modification, are less than \$100 they are dropped and canceled. Such is *not* the case with regulatory violations so they, along with others, are subject to further adjustment.

The foregoing procedure is used to produce a modified base penalty for nonserious violations. Regulatory violations have their own schedule of penalties not to exceed \$1,000. They are not adjusted for severity, extent and likelihood, but are adjusted for good faith, size, history and abatement as described in the following paragraphs. Each *serious* violation carries a flat assessment of \$1,000. Adjustments are made for good faith, size and history, but not for severity, extent and likelihood.

If a nonserious, regulatory or serious violation is repeated (a new violation of a standard previously cited or

ordered corrected) the penalty is multiplied as follows:

1st repeat—times 2 the base amount

2nd repeat—times 4 the base amount

3rd or more repeat—times 10 the base amount,
limited to a maximum of \$10,000

If a nonserious, regulatory or serious violation is willful, the base penalty is multiplied by a number determined by the District Manager based upon the circumstances of the violation and place of employment; however the product must not exceed \$10,000.

At this state all penalties are adjustable for good faith, size, and history. If good faith (based primarily upon quality of safety program) is well demonstrated, 20 percent of the base penalty is subtracted. If good faith is average, 10 percent is subtracted. If good faith has been poor, no related adjustment is made.

If there are fewer than 20 employees at the site, 10 percent of the base penalty is subtracted. If there are between 20 and 100 employees, 5 percent is subtracted. If there are over 100 employees no adjustment is made for size.

If history of compliance (usually determined by examination of employer's file) is good, 20 percent of the base penalty is subtracted. If history of compliance is fair, 10 percent is subtracted. If it is poor, no change is made.

Those penalty figures thus arrived at, that apply to nonserious or regulatory violations, are then subjected to an abatement adjustment. Fifty percent of the penalty amount is subtracted. If the violation is not abated within the time allowed this credit will be rescinded, and an additional failure-to-abate penalty imposed. The additional penalty is \$100 per day for each full calendar day a nonserious or regulatory violation exists after the expiration of the abatement date.

Serious violations receive no abatement credit under any circumstances, but an additional penalty to be determined by the District Manager is charged for each full calendar day beyond the abatement date a serious violation remains uncorrected. The daily failure-to-abate penalty for serious violations must be at least \$100 but not more than \$1,000.

Payments of Civil Penalties are received by the Fiscal Officer of the Department of Industrial Relations and deposited into the General Fund of the State of California.

As provided in the Labor Code, civil penalties are not assessed against employers that are governmental entities.

This review of penalties applies only to civil penalties assessed by the Division of Industrial Safety. Other sections of the Labor Code provide for various criminal penalties depending upon the type of violation and the related court decision.

PUBLICATIONS AVAILABLE

The following bulletins and placards are available without cost by writing to the Division of Industrial Safety, Education Unit, 455 Golden Gate Avenue San Francisco, Ca. 94102 or 3460 Wilshire Boulevard Los Angeles, Ca. 90010 or other Division offices.

BULLETINS

S-103 "Safe Handling of LP Gas" gives the use and characteristics of LP gas and rules for safe handling.

S-109 "Safety Films Available from the State Division of Industrial Safety."

S-111 "Farm Safety Check List" is a safety guide for everyone on the farm.

S-117 "Stop Grinding Out Injuries!" describes abrasive wheel precautions.

S-120 "Safety Rules for Painters" shows how to prevent injuries to painters.

S-122 "Handy Rules for Hand Tools" describes the proper care and use of many common tools.

S-123 "Three Steps for the Safe Use of Portable Ladders" explains how to avoid ladder accidents. (Also available in Spanish.)

S-124 "Safety Rules for Roofers" alerts to dangers and gives precautions against slips and falls, tar burns, strains and ladder injuries.

S-125 "Are You Using Carbon Tet?" deals with a hazardous chemical.

S-127 "Look Out for Yourself When Around Crop Spraying" is directed to farmworkers. (Also available in Spanish.)

S-128 "If You Work in a Quarry" covers quarry and open-pit mine workers.

S-137 "Skin Trouble Is Plenty Trouble" deals with the most common disease you can get at work. (Also available in Spanish.)

S-141 "Power Hand Saw Safety" gives causes of power hand saw injuries.

S-142 "Live With the Label" cautions users of hazardous substances.

S-143 "Trade Association Safety Programs" reveals their value.

S-145 "Safety Publications Available from the State Division of Industrial Safety."

S-146 "Safety in Pipeline Construction" tells how to plan and organize pipeline jobs and how to insure safety in various phases of the job.

S-148 "The Safe Use of Aqua Ammonia in Agriculture" describes necessary precautions for safe use of aqua ammonia.

S-149 "Safety Program for the Construction Contractor" discusses the essentials of a safety program for construction workers.

S-150 "Electrical Safety and Swimming Pools" describes precautions to take to make swimming pools safe electrically.

S-153 "Electrical Safety on the Farm" tells how to guard against electrical hazards. (Also available in Spanish.)

S-154 "The Tailgate Safety Meeting" gives pointers on effective means to promote on-the-job safety.

S-156 "Guard Standards No. 1—Materials and Construction" gives invaluable advice on constructing guards and selecting right material for them.

S-157 "Guard Standards No. 2—Stairways and Railings" gives requirements for stairways, railings, entrances to stairways, and floor and wall openings.

S-160 "Confined Space Can Be a Death Trap!" Describes hazards of work areas where poisonous gases can build up or oxygen be lacking—sewers, tank cars, vats, shafts, barges, silos, etc.—and what to do about this danger.

S-802 "Lock Out Block Out" tells how to safely lock out or block out machinery or equipment.

S-803 "Standard Whistle Signals for High Lead Logging" gives complete set of signals.

S-804 "Fork Lift Truck Operation" safety and common sense in material handling by fork lifts. States rules and gives accident prevention tips.

S-806 "Hand Lifting" safety and common sense in material handling through correct lifting techniques.

PLACARDS

S-101 "Safe Handling of LP Gas" gives safe procedures for handling and installing LP gas units. (5½" x 8½")

S-611 "Construction Hoisting Signals" gives bell or whistle signals required by the Construction Safety Order 1612(c). (5½" x 7")

S-612 "Notice! Fuse Used Here Burns at the Rate of One Foot in — Seconds." (8½" x 11")

S-615 "Stop Machinery Before Oil-ing, Cleaning, Repairing." (8½" x 11")

S-617 "Wear Goggles. You Can Get Used to Goggles—But Never to a Glass Eye." (8½" x 11")

S-627 "Caution! Don't Go Between Brow Log and Load. Don't Dump Logs Until All Men Are Clear." For use at log dumps and ponds. (8½" x 11")

S-800 "Hand Signals for Boom Equipment Operation" shows approved arm and hand signals in diagrams. (8½" x 11")

S-801 "The ABCs of Safety" is an amusing alphabet in which every letter relates to safety. (8½" x 11")

S-807 "Emergency Numbers for this Project—Ambulance, Fire-Rescue, Police, Hospital." (½" x 11")

S-809 "Safe Practice for Mounting and Inflating Tires with Split Rim and/or Retainer Rings." (8½" x 11")

S-810 "Safe Practice for Mounting and Inflating Passenger Car and Other Drop Center Wheel Tires." (8½" x 11")

S-812 "Operating Rules for Industrial Trucks, Industrial Tow Tractors, Fork Lift Trucks."

STICKERS

S-616 "Warning—This machine is automatically controlled and may start at any time." (3" x 5¼") (Also available in Spanish.)

S-658 "Remember! This guard is here for your protection!" (3" x 5¼")

S-808 "Blasting Signals" Warning, Blasting, All-Clear Signals. (3" x 5¼")

They Needn't Have Died

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
A laborer was riding on a forklift truck as a passenger when he was thrown off and killed.	Riding on a forklift truck without proper seat.	No seat provided for rider.	Never ride on a forklift truck without a seat and safety belt.
A maintenance man drowned when his boat capsized during a repair job.	The maintenance man was not wearing a life-jacket.	The maintenance man could not swim.	Wearing a lifejacket should be mandatory when there is a risk of drowning.
A heavy-equipment mechanic was crushed when a front-loader bucket fell on him.	The mechanic was working under the front-loader bucket.	The raised bucket was unblocked.	Never leave controls of front-loader bucket when bucket is above an employee. Always use blocking procedure.
A contractor foreman stepped backward on a scaffold, the guard rail broke loose and he fell, crushing his skull.	Foreman stepped backward without looking.	Guard rail improperly installed.	Secure guard railing on both ends.
A carpenter was working on a platform standing on a ladder. There were no guardrails. The ladder fell over and the carpenter fell to his death.	The carpenter had not tied himself off.	There was no guard-rail on the platform.	When working on a ladder on a platform, always use a safety belt.
An oiler was struck by the pendant line of a collapsing crane boom.	The oiler was not wearing a hardhat. The crane boom was operated beyond design capacity.	Weakened crane boom.	Use crane boom for loads within its design limits. Check for metal faults. Employees must wear hardhats.
A pipelayer working in a trench was crushed in a cave-in.	Employee was working in a poorly shored trench.	The trench shoring was inadequate for the soil conditions.	Install adequate trench shoring.
Employee overcome by hydrogen sulfide gas while removing debris from sewer manhole.	Employee entered un-ventilated area without a respirator and safety harness.	The manhole was not ventilated. Respirators and safety harness were not provided by the employer.	Provide ventilation and use safety harness in confined areas. Make respirators available.
A forklift truck backing up in a warehouse struck and killed the plant superintendent.	The forklift driver failed to see that no one was in his way.	The illumination was inadequate. The canopy of the forklift restricted the driver's rear view.	Provide adequate illumination in the work area.
A laborer was electrocuted when he contacted a 12 KV line while standing on a steel tank being moved.	Standing on a steel tank being moved.	The tank was under power lines with less than six feet of clearance.	Do not ride on a moving tank. Use a wooden pole to raise telephone lines when needed.
Employee backed pickup truck into garage, leaving motor running, and doors closed. He was found dead on garage floor.	Working in closed area with automobile engine running.	No ventilation and engine running.	Never work in a closed area with automobile engine running and no ventilation.
Employee was using cyanide gas to kill bees in a confined space in attic of a house without wearing respiratory equipment. Died from poison gas inhalation.	Working alone in a confined space using poisonous cyanide gas without respiratory equipment.	Poisonous gas in a confined space.	Use two men when fumigating with poisonous gas and wear approved respiratory equipment.
A cable splicer was repairing an energized broken low-voltage power cable in a 15-inch wide dirt trench. He contacted the bare conductor and was electrocuted.	Working on the circuit while it was energized.	"Hot" circuit and inadequate work space.	De-energize circuits before working on them.
Maintenance man was scraping loose paint off a loading dock wall. He was crushed between a backing vehicle and face of loading dock.	Not using warning signs.	Unguarded area.	Mark off area "No personnel allowed in Truck Dock Ground Area."

Offices of the Division of Industrial Safety

MAIN OFFICES

San Francisco..... 455 Golden Gate Ave. 94102 415-557-1946
Los Angeles..... 3460 Wilshire Blvd. 90010 213-381-1332

REGIONAL OFFICES

Fresno..... 2550 Mariposa St. 93721 209-488-5274
Los Angeles (South)..... 3460 Wilshire Blvd. 90010 213-381-5695
Los Angeles (North)..... 8155 Van Nuys Blvd. 91402 213-988-6141
Sacramento..... 2422 Arden Way 95825 916-445-0668
San Diego..... 1309 State St. 92101 714-236-7325
San Francisco..... 1540 Market St. 94102 415-557-1677

DISTRICT OFFICES

Bakersfield..... 225 Chester Ave. 93301 805-324-6437
Concord..... 1070 Concord Ave. 94520 415-676-5333
El Monte..... 3415 Fletcher Ave. 91731 213-572-6960
Fresno..... 2550 Mariposa St. 93721 209-488-5302
Long Beach..... 230 E. Fourth St. 90802 213-432-8443
Los Angeles (West)..... 3460 Wilshire Blvd. 90010 213-381-3861
Modesto..... 1800 Coffee Rd. 95355 209-529-7751
Oakland..... 1111 Jackson St. 94607 415-464-0660
Panorama City..... 8155 Van Nuys Blvd. 91402 213-782-1800
Redding..... 1421 Court St. 96001 916-246-1621
Sacramento..... 2422 Arden Way 95825 916-445-5818
Salinas..... 21 W. Laurel Dr. 93901 408-449-7235
San Bernardino..... 303 W. Third St. 92401 714-383-4321
San Diego..... 1309 State St. 92101 714-236-7325
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San Jose..... 888 No. First St. 95112 408-277-1260
San Mateo..... 2555 Flores St. 94403 415-573-1718
Santa Ana..... 28 Civic Center Plaza 92701 714-558-4141
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Santa Rosa..... 750 Mendocino Ave. 95401 707-542-8802
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Eureka..... 619 Second St. 95501 707-442-5748
Ukiah..... 264 E. Smith St. 95482 707-462-8850
Ventura..... 5810 Ralson St. 93003 805-642-1475

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STATE OF CALIFORNIA
Ronald Reagan, Governor

Agriculture and Services Agency

DEPARTMENT OF INDUSTRIAL RELATIONS
H. Edward White, Director

DIVISION OF INDUSTRIAL SAFETY
Richard Wilkins, Chief

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Supervising Engineer
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CHIEFLY SPEAKING



Richard Wilkins

As of January 1, 1974, the California Division of Industrial Safety will be enforcing health and safety standards as outlined in the Cal/OSHA plan. Financial sanctions will be issued against employers in the State when California safety and health standard violations are found during investigations or inspections.

Also on January 1, the Federal OSHA enforcement program will end. The Federal Department of Labor will still be involved with the California plan in that it will close open transactions, monitor the State program, and investigate any complaints that the State program is ineffective. However, because there will no longer be both State and Federal government enforcement programs, the confusion which such jurisdictional duality creates will be avoided.

Cal/OSHA requires employers to post a notice advising employees of their rights. The poster will be mailed to all employers in the State shortly after January 1, 1974.

The Cal/OSHA program will be discussed in detail at the Cal/OSHA seminars being held at various locations around the State. The seminars are free to the public. They are the only official, State sponsored meetings to

provide the public with authoritative information about Cal/OSHA.

I will head the staff of experts at the presentation. During the morning session, I will explain the general intent of the California Occupational Safety and Health Act. I will discuss AB 150, the legislation outlining the State OSHA plan. I will cover, among other topics, the rights and duties of employers, recordkeeping requirements, consultation services, inspection procedures, and the function of the Cal/OSHA Standards Board and the Appeals Board.

During the afternoon, the assembly will be divided into workshops. Local experts of the Division of Industrial Safety will answer specific questions regarding General Industry and Construction Orders, Electrical Safety Orders, recordkeeping, and the role of the Department of Health under Cal/OSHA.

The seminars draw large audiences. Consequently, if you wish to attend one, I would advise you to come early. The facilities may be limited.

If you have any questions regarding the Cal/OSHA plan or seminars, contact your local District Manager of the Division of Industrial Safety.

COVER PICTURE

Governor Ronald Reagan signs AB-150, California Safety and Health Act. He is flanked from left to right by Jimmy Lee, President of the State Building and Construction Trades Council of California, Albert Turner, Chairman of the Standards Board, Vern Cannon, Teamster's Legislative Council, and Ed White, Head of the Department of Industrial Relations.

AB-150 PUTS CAL/OSHA PLAN INTO ACTION

CAL/OSHA—AB 150*

*Enabling legislation required by the California Occupational Safety and Health Plan.

PURPOSE

The California Occupational Safety and Health Act of 1973 was enacted for the purposes of: a) assuring safe and healthful working conditions for all California working men and women by enforcement of effective standards, and by b) helping employers to maintain safe and healthful working conditions.

Section 1—JURISDICTION AND DUTIES

The Agriculture and Services Agency is responsible for administering the CAL/OSHA plan. All enforcement and rulemaking authority will be with the Department of Industrial Relations.

In order to enforce and administer all standards and orders or special orders requiring places of employment to be safe and healthy, the Division of Industrial Safety has the power, jurisdiction, and supervision over every place of employment in this state.

The Division, in enforcing occupational safety and health standards, may do any of the following:

- (A) Declare and prescribe what safety devices are well adapted to render the employees or places of employment safe.
- (B) Enforce standards and orders adopted by the Standards Board for the installation, maintenance and operation of safeguards.
- (C) Require the performance of any act which the protection of the safety of the employees reasonably demands.

INSPECTIONS

When the Division of Industrial Safety learns or has reason to believe that any employment is not safe, it may, on its own motion or upon complaint, investigate with or without notice or hearing.

Only the chief or, in the case of his absence, his authorized representatives will have the authority to permit advance notice of an inspection or investigation. In no case, except when there is imminent danger to an employee, is advance notice to be given when an inspection is to be made as a result of an employee complaint.

Any person who gives advance notice without authority of any inspection to be conducted, is guilty of a misdemeanor and upon conviction, shall be fined not more than \$1,000 or by imprisonment for not more than six months or by both.

All information obtained by the Division of Industrial Safety in connection with any inspection which might reveal a trade secret, shall be considered confidential.

To make an investigation or inspection, Division representatives, upon presenting appropriate credentials

to the employer, have free access to any place of employment. Any person who obstructs or hampers such an investigation or inspection is guilty of a misdemeanor.

Any employer who neglects or refuses to furnish statistics which are directly related to the purpose of the investigation or inspection, or who refuses to admit the authorized representatives engaged in the performance of their duties to a place of employment, is guilty of a misdemeanor.

Representatives of both the employer and the employees have the right to accompany any Division representative while he makes an inspection. They can also discuss safety violations or problems with the inspector privately during the course of an inspection. If there is no employee representative, the inspector may consult with a reasonable number of employees on his inspection.

CITATION

If, upon inspection, the Division feels that an employer has violated any standard, rule, order, or regulation it shall issue a citation. Each citation shall be in writing and describe the violation, including reference to the provision of the code alleged to have been violated. In addition, the citation will fix a reasonable time for the abatement of the alleged violation.

In the event the violations found in an inspection do not have a direct relationship upon the health and safety of an employee, a "notice", in lieu of a citation, may be issued.

For each citation issued, a copy must be posted for three days or until the unsafe condition is abated, whichever is longer.

No citation or notice will be issued by the Division for a given violation after six months have elapsed since the occurrence of the violation.

The Division will maintain records which will supply inspectors with previous citations and notices issued to an employer.

If the Division issues a citation, it will notify the employer by certified mail of the citation, and the employer has *15 working days* from receipt of the citation to notify the Appeals Board that he wishes to appeal.

If the Division issues a citation for a serious violation, the Division will reinspect at the end of the period of abatement of the violation.

INVESTIGATIONS

The Division will investigate the causes of any accident which is fatal to one or more employees or which results in a serious injury to five or more employees. (For definition of "serious injury" see page 6.)

The Division may investigate the causes of any other accident or illness which has caused serious injury,

(for definition see page 6) or, which has a probability of causing serious injury, which directly or indirectly arises from employment.

Within the Division is a *Bureau of Investigations*. The Bureau is responsible for directing accident investigations involving violations of standards or orders in which there is a serious injury, a death, or request for prosecution by a Division representative. It is also responsible for preparing cases for prosecution.

The authorized representatives of the Bureau have the right to go into all places of employment necessary for the investigation and may collect any evidence they deem necessary for the investigation.

In any case where the Bureau is required to conduct an investigation when there is a serious injury or death, the results of the investigation shall be referred for appropriate action to the city or district attorney having jurisdiction.

COMPLAINTS

When the Division receives a complaint from an employee that a place of employment is unsafe, it will investigate as soon as possible but no longer than three working days, with or without notice or hearing. Complaints of serious hazards will take priority.

Accurate records will be maintained by the Division of all complaints, whether verbal or written. The complainant will be informed of any action taken by the Division and the reasons for such action.

Action against employees subsequent to complaints of unsafe conditions is forbidden under CAL/OSHA. The name of any person submitting a complaint regarding unsafe conditions shall be kept confidential upon the request of the person.

Employees will not be laid off or discharged for refusing to work where any safety or health standard is violated, and when such violation creates a hazard to the employee or his fellow employees.

Any employee who believes that he has been discharged or otherwise discriminated against, may file a complaint with the Labor Commissioner.

HAZARDOUS CONDITIONS: RESTRICTIONS

If the condition of any employment or the operation of equipment constitutes a serious menace to the employees, the Division may request the courts for an injunction restraining the operation until the condition is corrected.

If the Division believes a place of employment or equipment is dangerous and not properly guarded and constitutes an *imminent hazard* to employees, entry or use will be prohibited, and a conspicuous notice to that effect will be posted.

The notice shall not be removed except by an authorized representative of the Division or until the place or equipment is made safe with required safeguards. Any person who defaces or removes any notice issued by the Division is guilty of a misdemeanor punishable by a fine of up to \$1,000 or one year in a county jail or both.

Once an imminent hazard exists and the use of the equipment has been prohibited, the employer may re-

quest and be granted an appeal hearing within 24 hours to review the validity of the Division's order.

SAFETY NOTICES

It is the duty of the Division to prepare a notice containing information regarding safety rules and regulations, including information concerning the nearest Division office, employees rights, or any other information the Division deems necessary. It shall be supplied to employers as soon as practical. The Division will promulgate regulations on the content, the required location, and number of notices which must be posted by employers. Sufficient posters in both English and Spanish shall be printed to supply employers.

SAFETY-HEALTH ORDERS, STANDARDS

The Division of Industrial Safety will enforce all occupational safety and health standards. General safety orders heretofore adopted by the Industrial Accident Commission or the Industrial Safety Board will continue to remain in effect, but they may be amended or repealed.

Other agencies may assist the Division in the enforcement of occupational safety and health standards upon written agreement with the Department of Industrial Relations. Authorized representatives of such agencies may then have right of access to enter any place of employment under the Division's jurisdiction.

If any representative of an agency operating under such an agreement becomes aware of an imminent hazard, he will notify the employer and his employees of the hazard and immediately notify the Division of Industrial Safety.

Nothing may limit or reduce the authority of local agencies to adopt and enforce higher standards relating to occupational safety and health for *their own* employees.

OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

Within the Department of Industrial Relations is the Occupational Safety and Health Standards Board which consists of seven members who shall be appointed by the Governor.

All meetings held by the Board shall be open and public. Notice of the Standards Board meetings will be published in major newspapers. Interested people will be given time at the meetings to propose amendments or (new) standards that are appropriate for adoption.

The Board may adopt, amend or repeal occupational safety and health standards and orders.

The Board is the only agency in the state authorized to adopt occupational safety and health standards. The Board shall adopt standards at least as effective as the federal standards for all issues for which federal standards have been promulgated.

The Board shall refer for evaluation to the State Department of Health any proposed occupational *health* standard or variance from adopted standards

received by the Board from sources other than the State Department of Health. The Board shall refer for evaluation to the Division of Industrial Safety any proposed occupational *safety* standard or variance received by the Board from sources other than the Division of Industrial Safety.

STATE DEPARTMENT OF HEALTH—ROLE

The State Department of Health, in connection with the enforcement of occupational safety and health standards, will:

- (1) Upon request from the D.I.S., help in the inspection of specific workplaces in order to evaluate occupational health programs or environmental conditions which may be harmful to the health of employees.
- (2) Upon request of the D.I.S., any employer or employee, or on its own initiative, conduct special investigations of occupational health problems which are unrelated to a specific enforcement type action to the extent that the circumstances indicate and priorities permit.
- (3) Provide a continuing program of training for safety engineers of the D.I.S. in the recognition and handling of health hazards.

The State Department of Health may make written agreements with local health departments to conduct inspections and evaluations of occupational health problems.

The Occupational Safety and Health Standards Board will refer to the Department of Public Health for evaluation, any proposed occupational health standard or variance from an occupational health standard.

Connected with the development of occupational health standards, the State Department of Health will perform the following functions:

- (a) Analyze federal occupational health standards and evaluate their impact on California.
- (b) Maintain relations with the National Institute of Occupational Safety and Health (NIOSH) and federal OSHA in the development of recommended federal standards and, when appropriate, provide feedback.
- (c) On occupational health issues not covered by federal standards, maintain surveillance, determine the necessity for standards, and develop and present proposed standards to the Board.
- (d) Evaluate any proposed occupational health standard or application for a variance.
- (e) Appear and testify at Board hearings and other public proceedings involving occupational health matters.

Section 2—EDUCATION AND RESEARCH

EDUCATION

The Division will maintain an education and research program for the purpose of providing in-service training of Division personnel, safety education for

employers and employees, and research and consulting safety services.

The Division is responsible for preparation and distribution of information concerning occupational safety and health programs and methods. This information may include, but is not limited to, safety publications, films, speeches, etc.

Safety training programs will be provided by the Division upon request. Priority for the development of safety training programs will be with those occupational areas where the greatest hazards exist.

RESEARCH

The Division will conduct research into methods, means, operations, techniques, processes, and practices necessary for improvement of occupational safety and health.

CONSULTATION SERVICE

Upon request, the Division will provide safety and health consulting services to any employer or employee group. Such consulting services include providing employers or employees with information, advice, and recommendations on maintaining safe and healthful work practices.

If an employer requests consulting services, the Division, when providing such services, cannot institute any prosecution nor issue any citations for a violation of a standard or order. The *exception* is when the Division representative providing the consulting service finds the condition of employment or equipment constitutes an imminent hazard to the lives or safety of employees.

Section 3—RESPONSIBILITIES OF EMPLOYERS AND EMPLOYEES

RESPONSIBILITIES AND DUTIES

Every employer shall furnish employment and a place of employment which are safe and healthful for the employees therein.

Every employer shall furnish and use safety devices and safeguards and shall adopt and use practices and processes which are adequate for the safety and health of his employees. The employer will do everything reasonable to protect the safety and health of his employees.

No employer may require or permit an employee to work in a place that does not meet safety and health standards.

No employer shall neglect or fail:

- (a) To provide and use safety devices and safeguards.
- (b) To adopt and use safe methods and practices.
- (c) To do everything possible to protect the life, safety, and health of his employees.

No employer, owner, or lessee of any real property will construct or cause to be constructed any place of employment that is not safe and healthful.

No person may do any of the following:

- (a) Remove, displace, destroy or walk off with any safety device, or notice or warning.

- (b) Interfere in any way with the use thereof by any other person.
- (c) Interfere with the use of any method or process adopted for the protection of any employee, including himself.
- (d) Fail or neglect to do every other thing to protect employees.

Every employer and every employee will comply with occupational safety and health standards and all rules, regulations, and orders which are applicable to his own actions and conduct.

INFORMATION

All employers will provide information to employees in the following ways, as prescribed by regulations:

- (a) Posting of information regarding protections and obligations of employees under occupational safety and health laws.
- (b) Posting prominently each citation issued.
- (c) The opportunity for employees or their representatives to observe monitoring or measuring of employee exposure to hazards.
- (d) Allow access by employees or their representatives to accurate records of employee exposures to potentially toxic materials.
- (e) Notification of any employee who has been or is being exposed to toxic materials in levels exceeding those prescribed by an applicable standard, order, or special order, and informing any employee so exposed of corrective action being taken.

RECORDKEEPING

Every employer, insurer, and physician who attends any injured employee must file with the Division of Labor Statistics and Research a complete report of every injury or occupational illness to each employee arising out of or in the course of his employment, unless disability resulting from such injury does not last through the day or does not require medical service, other than ordinary first aid treatment.

In every case involving a serious injury, illness, or death, in addition to the report required, a report must be made immediately by the employer to the Division of Industrial Safety by telephone or telegraph.

Serious injury or illness shall be defined as any injury or illness occurring in connection with any employment which requires inpatient hospitalization for a period in excess of 24 hours for other than medical observation or, in which an employee suffers loss of any member of the body or any serious degree of permanent disfigurement. Excludes those resulting from violation of the Penal Code (except Section 385) or from an accident on a public street or highway.

Whenever a state, county or local fire or police agency is called to an accident involving an employee in which a serious injury or death occurs, the nearest office of the Division of Industrial Safety will be noti-

fied by telephone immediately by the responding agency.

The reports made to the Division of Labor Statistics and Research will be recorded in form and detail prescribed. All questions will be answered as required by the Division of Labor Statistics and Research under its rules and regulations.

All state and local government employers must maintain records and make reports in the same manner and to the same extent as required of other employers.

Nothing in this section requiring recordkeeping and reporting by employers shall relieve an employer of maintaining records and making reports to the Assistant Secretary, United States Department of Labor, as required under Federal Occupational Safety and Health Act of 1970 (P.L. 91-596).

No information furnished to the Division of Labor Statistics and Research by an employer or insurer will be open to the public. No report of injury required to be filed by an employer or insurer will be admissible as evidence in any adversary proceeding before the Workmen's Compensation Appeals Board.

Section 4—PENALTIES

Except where other penalties are specifically provided, every employer, management official, or supervisor having direction or control of any employment, who does any of the following will be guilty of a *misdemeanor*:

- (a) Knowingly or negligently violates any standard, order or special order, the violation of which is deemed to be a serious one.
- (b) Repeatedly violates any standard or order which creates a real and apparent hazard to employees.
- (c) Fails or refuses to comply, after notification and expiration of any abatement period, with any such standard, order, or special order where the failure or refusal creates a real and apparent hazard to employees.

Any employer who willfully violates any occupational health or safety standard, and whose violation causes death to an employee or permanent impairment will, upon conviction, be fined not more than \$10,000 or by six months in jail or both. On a second offense of this same nature, a penalty of not more than \$20,000 or by imprisonment for not more than one year or both will be imposed.

Anyone making false statements on records filed or required to be maintained, shall, upon conviction, be fined not more than \$10,000 or imprisonment of not more than six months or both.

A *non-serious* violation *may* be assessed a civil penalty of up to \$1,000 for each such violation.

A *serious* violation *shall* be assessed a civil penalty of up to \$1,000 for each such violation.

Any employer who willfully or repeatedly violates any occupational safety or health standard or order may be assessed a civil penalty of not more than \$10,000 for each violation.

Failure to correct a violation of any occupational safety and health standard within the period permitted for correction may be assessed a civil penalty of not more than \$1,000 for each day during which such failure or violation continues.

Any employer who violates any of the posting requirements will be assessed a civil penalty of up to \$1,000 for each violation.

The *civil* penalties provided for in this section shall *not* be assessed against employers who are governmental entities.

Section 5—VARIANCES

PERMANENT

Any employer may apply to the Standards Board for a permanent variance from an occupational safety or health regulation if he shows an alternative program or method which will provide equal or superior safety for employees.

The Occupational Safety and Health Standards Board will issue such a variance to an employer if it provides equal or superior safety conditions for the employees. A permanent variance may be modified.

TEMPORARY

A temporary variance can be granted by the Division of Industrial Safety if an employer establishes:

- (a) that he is unable to comply because resources cannot be located by effective date for compliance with the standard,
- (b) he is taking all available steps to safeguard his employees against hazards covered by the standard,
- (c) he has an effective program for coming into compliance with the standard as quickly as practicable.

Section 6—PROJECT PERMITS

REQUIREMENTS

For those places of employment which by their nature involve a substantial risk of injury, the Division will require the issuance of a permit prior to any work or employment.

Such employment will be limited to:

- (a) Construction of trenches or excavations which are 5 feet or more deep into which a person is required to descend.
- (b) The construction of any building, structure, falsework, or scaffolding work more than 3 stories high.
- (c) The demolition of any building, structure, falsework, or scaffolding more than 3 stories high.

Any employer subject to the above shall apply to the Division of Industrial Safety for a permit.

The Division may investigate or confer prior to the start of actual work. A permit will be issued when an employer demonstrates safe methods will be used. On good cause, the Division may revoke any permit that

has been issued. Any employer denied a permit may appeal such a denial.

Section 7—APPEALS

OCCUPATIONAL SAFETY AND HEALTH APPEALS BOARD

The Occupational Safety and Health Appeals Board consists of three members, appointed by the Governor, representing management, labor and the general public. Each member will serve a term of four years.

APPEALS PROCEDURES

Any employer served with a citation or a notice of a civil penalty may appeal to the Appeals Board within 15 working days from receipt of such citation, or such notice, with respect to alleged violations, abatement periods and amount of proposed penalties.

If, within 15 working days from receipt of the citation or notice of penalty, the employer fails to notify the Appeals Board that he intends to contest the citation or penalty notice, and no notice is filed by any employee or employee representative within such time, the citation or notice of civil penalty shall be deemed a final order of the Appeals Board and not subject to review by any court or agency. The 15-day period may be extended by the Appeals Board for a good cause.

If an employer notifies the Appeals Board that he intends to contest a citation or notice of civil penalty, or if, within 15 working days of the issuance of a citation any employee or employee representative files a notice with the Division of Industrial Safety or the Appeals Board claiming that the specified abatement period is unreasonable, a hearing must be granted.

The Appeals Board or a hearing officer will, within 30 days after the case is submitted, make and file findings upon all facts involved in the appeal and file an order or decision.

Any person affected by an order or decision of the Appeals Board may, within the time limit specified, apply to the superior court for a writ of mandate for the purpose of inquiring into and determining the lawfulness of the original order or decision or of the order or decision following reconsideration.

The findings and conclusions of the Appeals Board on questions of *fact* are conclusive and final and are not subject to review. Such questions of fact will include ultimate facts and the findings and conclusions of the Appeals Board. Upon the hearing, the court shall enter judgment either affirming or annulling the order or decision, or the court may remand the case for further proceedings before the Appeals Board.

* PLEASE NOTE—This informational bulletin on A.B. 150 is an abstract and condensation of the complete law. For questions or details not covered, refer to a complete text of the law or contact Richard Wilkins, Chief of the Division of Industrial Safety, 455 Golden Gate Ave., San Francisco, 94102. (Tel. 415-557-1946)

This information compiled by the Safety and Health Services Department of the California State Compensation Insurance Fund.

SAFETY AND HEALTH PROTECTION ON THE JOB



State of California
Agriculture and Services Agency
DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF INDUSTRIAL SAFETY

The California Occupational Safety and Health Act of 1973 provides job safety and health protection for workers. The State Agriculture and Services Agency has primary responsibility for administering the Act, exercised through the Department of Industrial Relations. Job safety and health standards are promulgated by the Occupational Safety and Health Standards Board. Employers and employees are required to comply with these standards. Enforcement is carried out by the Division of Industrial Safety within the Department of Industrial Relations.

EMPLOYERS AND EMPLOYEES

The California Act states that every employer shall furnish employment and a place of employment which are safe and healthful for the employees therein, and that every employer and every employee shall comply with occupational safety and health standards and all rules, regulations, and orders pursuant to Division 5 of the California Labor Code which are applicable to his own actions and conduct.

COMPLIANCE WITH SAFETY AND HEALTH REQUIREMENTS

To ensure compliance with safety and health requirements, the State Division of Industrial Safety conducts periodic job site inspections. The inspections are conducted by trained safety engineers. The law provides that an authorized representative of the employer and a representative of the employees be given an opportunity to accompany the safety engineer for the purpose of aiding the inspection. Every employee has the right to bring unsafe or unhealthful conditions to the attention of the safety engineer making the inspection. In addition, every employee has the right to notify the Division of Industrial Safety if unsafe and unhealthful conditions are believed to exist at the work site.

If the Division of Industrial Safety believes that an employer has violated a safety and health order of the State of California, it issues a citation to the employer. The Division may impose civil penalties.

Citations of violations issued by the Division of Industrial Safety must be prominently displayed at or near the place of violation.

Any employee may protest the time given for abatement of the violation.

An employee may not be discharged or discriminated against in any way for filing complaints concerning unsafe working conditions or work practices in a place of employment, or otherwise exercising rights granted under the Act.

Any employee has the right to observe monitoring or measuring of employee exposure to hazards and the right of access to accurate records of employee exposure to potentially toxic materials or harmful physical agents.

The right to refuse to work under conditions that endanger life or health shall not be denied any employee.

This notice shall be conspicuously posted in each place of employment in the State of California as provided by the rules and regulations of the Division of Industrial Safety.

For information and assistance contact the nearest office of the Division of Industrial Safety.

Offices of the Division of Industrial Safety

MAIN OFFICES
San Francisco 455 Golden Gate Ave. 94102 415-657-1943
Los Angeles 3460 Wilshire Blvd. 90010 213-381-1332

REGIONAL OFFICES
Fresno 2550 Mariposa St. 93721 209-488-5302
Los Angeles 3460 Wilshire Blvd. 90010 213-381-5695
Los Angeles (North) 8155 Van Nuys Blvd. 91402 213-782-1800
Sacramento 714 P St. 95814 916-445-5818
San Diego 1350 Front St. 92101 714-236-7325
San Francisco 1540 Market St. 94102 415-557-1677

DISTRICT OFFICES
Bakersfield 225 Chester Ave. 93301 805-324-6437
Concord 1070 Concord Ave. 94520 415-676-5333
El Monte 3415 Fletcher Ave. 91731 213-572-6960
Long Beach 230 E. Fourth St. 90802 213-432-8443
Los Angeles 3460 Wilshire Blvd. 90010 213-381-3861
Modesto 1800 Coffee Rd. 95355 209-529-7751

Oakland 1111 Jackson St. 94607 415-464-0660
Panorama City 8155 Van Nuys Blvd. 91402 213-782-1800
Redding 1421 Court St. 96001 916-246-1621
Salinas 21 W. Laurel Dr. 93901 408-449-7235
San Bernardino 303 W. Third St. 92401 714-383-4321
San Jose 888 No. First St. 95112 408-277-1260
San Mateo 2555 Flores St. 94403 415-573-1718
Santa Ana 28 Civic Center Plaza 92701 714-568-4141
Santa Barbara 5276 Hollister Ave. 93111 805-964-3554
Santa Rosa 750 Mendocino Ave. 95401 707-542-8802
Stockton 31 E. Channel St. 95202 209-948-7762
Vernon 2833 Leonis Blvd. 90058 213-589-5848

FIELD OFFICES
Chico 125 W. 3rd St. 95926 916-343-5182
Eureka 619 Second St. 95501 707-442-5748
Ukiah 264 E. Smith St. 95482 707-462-8850
Ventura 3418 Loma Vista Rd. 93003 805-642-1475

Persons wishing to register a complaint alleging inadequacy in the administration of the California Occupational Safety and Health Plan may do so at the following address: Occupational Safety and Health Administration • U. S. Department of Labor • Federal Building • 450 Golden Gate Avenue —Room 9470 • San Francisco, California 94102

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CAL/OSHA-1000

SEGURIDAD Y PROTECCIÓN DE LA SALUD

El Acta de Salud y Seguridad de los Trabajadores. La Agencia de Agricultura y Servicios, por medio del Departamento de Relaciones Industriales, por medio de la Junta de Normas. La División de Seguridad y Salud.

PATRONOS Y EMPLEADOS

El Acta de California establece que todo empleador debe proporcionar condiciones de trabajo seguras y saludables, y que todos los empleados deben cumplir con las regulaciones y normas del Código de Trabajo de California.

CUMPLIMIENTO CON LA LEY

Para asegurar el cumplimiento de la ley, la División de Seguridad y Salud realiza inspecciones periódicas en los lugares de trabajo. La ley dispone que el empleador y el empleado tienen la oportunidad de acompañar al ingeniero de seguridad durante la inspección. Todo empleado tiene el derecho de notificar a la División de Seguridad y Salud si cree que existen condiciones inseguras o no saludables en el sitio de trabajo.

Si la División de Seguridad y Salud de California cree que un empleador ha violado una orden de seguridad y salud del Estado de California, le emite una citación.

Las citaciones de violación emitidas por la División de Seguridad y Salud deben exhibirse prominentemente en o cerca del lugar de violación.

Cualquier empleado puede protestar el tiempo dado para la abe-

Cualquier empleado no puede ser despedido o discriminado de ninguna manera por presentar una queja relacionada con las condiciones de trabajo o por ejercer sus derechos bajo la ley.

El empleado tiene el derecho de observar el monitoreo o la medición de la exposición de los empleados a las peligrosas condiciones y el derecho de acceso a los registros que expliquen la exposición.

A un empleado no se le puede denegar el derecho a rechazar el trabajo en condiciones que pongan en peligro su vida o su salud.

Esta notificación debe ser exhibida conspicuamente en cada lugar de empleo en el Estado de California, tal como lo dispone la ley.

Para obtener información y asistencia, contacte la oficina más cercana de la División de Seguridad y Salud.

OFICINAS

San Francisco
Los Angeles
Fresno
Los Angeles
Los Angeles (North)
Sacramento
San Diego
San Francisco
Bakersfield
Concord
El Monte
Long Beach
Los Angeles
Modesto

OFICINAS

Chico
Eureka
Ukiah
Ventura

Las personas que deseen registrar una queja alegando inadecuación en la administración del Plan de Seguridad y Salud de California, pueden hacerlo dirigiéndose a la siguiente dirección: Administración de Seguridad y Salud Ocupacional • Departamento de Trabajo de los Estados Unidos • Edificio Federal • 450 Golden Gate Avenue • Sala 9470 • San Francisco, California 94102

AD Y ION DE LA N EL TRABAJO



State of California
Agriculture and Services Agency
DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF INDUSTRIAL SAFETY

La Ley de Seguridad Industrial de California del año de 1973 suministra seguridad y protección de la salud a los empleados de Servicios y Agricultura del Estado. La responsabilidad principal de administrar esta ley recae en el Departamento de Relaciones Industriales. La seguridad en el trabajo y las normas de salud se publican en las Normas de Salud y Seguridad Ocupacional. Los patronos y empleados tienen que cumplir estas normas. La Ley Industrial dentro del Departamento de Relaciones Exteriores hace cumplir estas normas.

La Ley requiere que cada patrono debe suministrar empleo y lugar para empleo que sean seguros y que los empleados estén protegidos, y que cada patrono y empleado debe cumplir con todas las normas de salud y seguridad ocupacionales, con las regulaciones, órdenes comprendidas en la División de Seguridad Industrial aplicables a sus acciones y conducta.

REQUISITOS DE SALUD Y SEGURIDAD

De acuerdo con los requisitos de seguridad y salud, la División del Estado de Seguridad Industrial controla los sitios de trabajo. Estas inspecciones son efectuadas por ingenieros de seguridad externa o representantes autorizados por el patrono y un representante de los empleados tengan la autorización de la División de Seguridad Industrial para ayudar a dicha inspección. Cada empleado tiene el derecho de retirarse de cualquier condición poco saludable o insegura. Además cada empleado tiene derecho de retirarse de cualquier condición que pueda considerarse insegura o poco saludable.

La División de Seguridad Industrial cree que el patrono ha violado una orden de salud y seguridad del Estado de California. La División puede imponer multas civiles.

Las violaciones emitidas por la División de Seguridad Industrial deben colocarse en una forma visible en el lugar de la violación.

El patrono debe proporcionar el tiempo especificado para la anulación de la violación.

El patrono no debe ser despedido del trabajo o perjudicado de ninguna otra manera por haber notificado una violación de las normas de salud y seguridad en el lugar de trabajo, o de otra manera ejercitar sus derechos.

El patrono debe observar los riesgos a que puede estar expuesto a peligros y tiene derecho a mirar los riesgos de estar expuesto a intoxicaciones de materiales u otros agentes peligrosos.

El patrono no puede negar el derecho de rehusar a trabajar en condiciones que pueda poner en peligro su vida.

Las violaciones deben colocarse en un lugar bastante visible en cada lugar de trabajo del Estado de California de acuerdo con las reglas y prácticas de la División de Seguridad Industrial.

El patrono y asistencia póngase en contacto con la oficina más cercana de la División de Seguridad Industrial.

Oficinas de la División de Seguridad Industrial

PRINCIPALES	
Golden Gate Ave. 94102 415-557-1946	Oakland 1111 Jackson St. 94607 415-464-0660
10 Wilshire Blvd. 90010 213-381-1332	Panorama City 8155 Van Nuys Blvd. 91402 213-782-1800
REGIONALES	Redding 1421 Court St. 96001 916-246-1621
150 Mariposa St. 93721 209-488-5302	Salinas 21 W. Laurel Dr. 93901 408-449-7235
10 Wilshire Blvd. 90010 213-381-5695	San Bernardino 303 W. Third St. 92401 714-383-4321
10 Van Nuys Blvd. 91402 213-782-1800	San Jose 888 N. First St. 95112 408-277-1260
714 P St. 95814 916-445-5818	San Mateo 2555 Flores St. 94403 415-573-1718
1350 Front St. 92101 714-236-7325	Santa Ana 28 Civic Center Plaza 92701 714-558-4141
1540 Market St. 94102 415-557-1677	Santa Barbara 5276 Hollister Ave. 93111 805-964-3554
DISTRICTALES	Santa Rosa 750 Mendocino Ave. 95401 707-542-8802
25 Chester Ave. 93301 805-324-6437	Stockton 31 E. Channel St. 95202 209-948-7762
10 Concord Ave. 94520 415-676-5333	Vernon 2833 Leonis Blvd. 90058 213-589-5848
15 Fletcher Ave. 91731 213-572-6960	OFICINAS DE CAMPO
230 E. Fourth St. 90802 213-432-8443	Chico 125 W. 3rd St. 95926 916-343-5182
60 Wilshire Blvd. 90010 213-381-3861	Eureka 619 Second St. 95501 707-442-5748
1800 Coffee Rd. 95355 209-529-7751	Ukiah 264 E. Smith St. 95482 707-462-8850
	Ventura 3418 Loma Vista Rd. 93003 805-642-1475

Se acusa al patrono de alegando insuficiencia por parte de la administración del Plan de Salud y Seguridad Ocupacional de la siguiente dirección: Occupational Safety & Health Administration • U. S. Department of Labor • Federal Room 9470 • San Francisco, California 94102

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TO ALL EMPLOYERS OF CALIFORNIA EMPLOYEES

Section 6408 (a) of the California Labor Code requires that information shall be posted regarding protections and obligations of employees under the occupational safety and health laws. This poster meets that requirement and must be prominently posted in all places of employment in the State of California. Section 6431 of the California Labor Code provides that any employer who violates any of the posting requirement of Section 6408 of the California Labor Code shall be assessed a civil penalty of up to one thousand dollars (\$1,000) for each violation.

Section 6434 states that the civil penalties provided for in this chapter shall not be assessed against employers that are governmental entities.

EFFECTIVE
MAY 1, 1974:

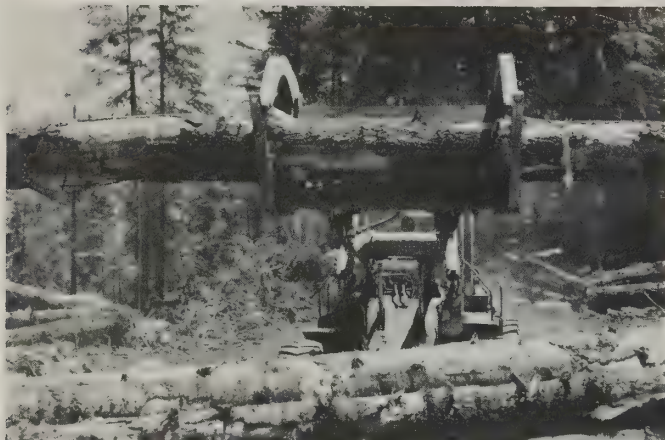
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A TODOS LOS PATRONOS DE LOS EMPLEADOS DE CALIFORNIA

La Sección 6408 (a) del Código Laboral de California exige que la información relacionada con la protección y las obligaciones de los empleados bajo las leyes de salud y seguridad ocupacional sean colocados en un lugar visible. Los letreros deben colocarse en un lugar prominente en todos los lugares de empleo del Estado de California. La Sección 6431 del Código Laboral de California dispone que cualquier patrono que viole cualquiera de las exigencias respecto a letreros descritos en la Sección 6408 del Código Laboral de California será multado con una penalidad civil hasta de mil dólares (\$1,000) por cada violación.

La Sección 6434 estipula que las imputaciones civiles suministradas en este capítulo no serán imputadas a los empleados gubernamentales.

NEW REPORT PINPOINTS LOGGING HAZARDS



Log handling by tractor

**Jean E. Powers, Section Head
Work Injury Statistics Section
California Division of Labor Statistics and Research**

Seasoned veterans in the woods know that only a smart logger gets to be an old logger.

The California Division of Labor Statistics and Research has taken a close look at the errors in judgment and other factors involved in fatal accidents in logging during the seven years from 1966 through 1972. The results have been released in the Division's most recent target-industry report, *Disabling Work Injuries in Logging, California*.

During the seven years studied, 101 logging employees lost their lives in work accidents. While an average of 14 lives lost yearly continues to represent a tragic waste, the effectiveness of the industry's efforts to reduce the toll must be judged in the light of comparison with earlier experience. In the seven years from 1959 through 1965, job-connected deaths to workers in the woods numbered 204. For the logger, the likelihood of early death on the job has been cut in half.

Since 1966, the greatest number of loggers died when they were crushed beneath *falling trees, snags, or branches*. The table that follows shows how the 36 fatalities involving falling trees or branches occurred.

Struck by tree being felled by others.....	9
Tree kicked back over stump.....	4
Falling limb	3
Struck by tree which had previously been undercut.....	3
Part of tree being felled broke off when it struck another tree	2
Trees that broke loose when tree or log that supported them was dislodged	2
Struck by falling snag.....	1
Tree struck by bulldozer blade.....	1
Struck by tree being felled, n.e.c.....	10
Tree fell—cause undetermined	1

n.e.c.—Not elsewhere classified.

Most, and possibly all of the deaths caused by falling trees or limbs could have been prevented if employees had observed certain well-established safety practices. In looking over the records of many of the accidents it becomes apparent that the faller failed to select a safe direction of fall for the tree to be cut, or that he did not plan his escape route before commencing the cut, or that he did not watch the falling tree or neighboring trees for flying limbs or kickbacks.

A few of the fatal accidents that occurred when trees were being felled are described below:

A timber faller, missing at lunchtime, was found dead near the butt of a tree which he had felled. Apparently, the tree he had cut brushed against another, breaking it off 30 feet above the ground, and the top flew back and struck the faller on the head. His chain saw was lying on the stump, and there was no evidence that he had attempted to move away from the position he had taken to fell the tree.

Two brothers were falling marked trees in a selective cut area on Forest Service land. One brother felled a large pine which struck another pine a little downhill. The other brother was turned away from the direction of the fall and was killed when he was struck behind the base of the skull by a limb thrown when the falling tree struck the tree below.

A faller was cutting the last of six redwood sprouts growing out of an old stump. He made the undercut but could not make the conventional backcut because the sprout was growing against the old stump, so he bored through the sprout and finished the backcut toward the outside as he stood on the adjacent stump. He cut through all the holding wood by boring close to the undercut, and as he jumped off the stump the sprout came back and hit him. He was dead when fellow workers reached him.

Logs—either being skidded or yarded, rolling downhill, or rolling from trucks—claimed 13 lives in the woods.

A turn of logs being skidded out on a hillside struck a log, dislodging it. The log rolled about 50 feet downhill and crushed a faller against a tree. The fallers should have been working several days ahead of the rigging crew.

A log truck driver had picked up a load of poles to the top of the stakes with two large cedar logs (2 by 26 feet) on top. One top wrapper was placed on the load. The driver drove the truck to the next landing. The landing was poorly laid out and the driver spent 5 to 10 minutes backing his truck down a slope between two stumps. The truck runway sloped to the right of the truck. The dust was so thick that the employee had to get out of the cab three times to let the dust settle in order to see where he was going. The driver removed the wrapper and binder from one side of the truck. When he removed the binder and started to pull the wrapper the cedar log rolled off the truck and crushed him. The accident could have been prevented by proper landing layout, load restraint before wrapper removal, dust control, and a nearly level landing.

A choker setter was setting chokers behind a Michigan rubber-tired skidder. The logs were winched up a bank and skidded down an old log road to the landing. The worker set chokers on two redwood logs, each of which was about 20 inches in diameter by 32 feet long. One choker was set back about 8 feet from the end. The turn was winched up part way and skidded onto the road. The logger gave the operator the go-ahead and the operator winched the turn in, proceeding down the road, and making a slight turn away from the choker setter. The outside log (with the set back choker) was winched over the inside log, striking the pan. The force of the log winched tight against the machine caused the other end of the log to swing violently toward the choker setter, striking him from behind, and fatally injuring him. Choker setters should be cautioned to set chokers near the end of the logs and to stay clear of the turn. Skidder operators should watch for other workers while winching the turn into the machine.

Accidents involving *heavy equipment or logging trucks* claimed 27 lives.

Thirteen of the deaths occurred as the result of equipment or vehicles which overturned or ran off the road:

A catskiner had backed his rubber-tired skidder over the edge of a skid road into a 150-foot canyon while winching a turn of logs up to the landing. The employee suffered a fatal skull fracture.

A catskiner drove up a skid road to move some logs out of the way of the fallers who were returning to the landing after being rained out. He backed to the outside edge of the roadway to let the fallers' pickup pass. A section of the road fill gave way and the tractor plummeted down the hill. The driver was thrown out 50 yards down the hill and was crushed to death. Although the tractor was severely damaged as it rolled 100 yards to another skid road, the canopy sustained only slight damage. It is possible that the driver might have survived if he had been wearing a strong harness or a seat belt and had remained in the cab.

A logging truck driver was killed when his empty rig overturned and pinned him in the cab. He is be-



High lead log landing

lieved to have gone over the bank trying to avoid a deer hunter who was standing in the roadway.

A catskiner and a choker setter were removing a log from a steep hill. The catskiner backed his tractor down a steep slope against a stump instead of letting out the main line. The stump was loose in the ground, and the "cat" slid 50 feet backward down the hill, then turned to the left and began rolling over. On the second roll, the operator slid out and was crushed beneath the canopy top. The operator probably would not have died had the rig been equipped with a seat belt.

Three woods workers died when tractors ran over them.

A choker setter was standing behind a tractor while a limb which was jamming the brakes was being removed. The cat operator accidentally hit the clutch while replacing the floor boards and the tractor rolled over onto the choker setter, inflicting fatal injuries.

A tractor moved, either accidentally or because the operator started it, while a choker setter was standing on its tracks. He fell off and was crushed between the tracks and the blade. The choker setter had climbed onto the tracks of the rig in order to reach a water canteen.

The lumber industry was targeted for intensive accident prevention efforts by the Occupational Safety and Health Administration not only because of the loss of life but also because the incidence of nonfatal work injuries is extremely high in relation to most other industries.

The California Division of Labor Statistics and Research does not compile an injury rate for logging activities separate from sawmill operation, as the bulk of the lumbering operations are conducted by firms that perform both the logging and milling. However, studies made by other organizations indicate that for the country as a whole the injury-frequency rate for logging is about double that for sawmills and planing mills as a group. Industry association materials also indicate that



High lead log haul

Continued on page 12

logging is the most hazardous of the activities engaged in by California lumber producers as well.

Certain characteristics tend to be associated with high-risk industries and the logging industry exhibits all of them. One such characteristic is *strenuous manual work*. Another is *outdoor work*. The greater difficulty in controlling the work environment outdoors than indoors must be recognized. A third characteristic found in many high-rate industries is *seasonal employment*. In seasonal industries there is a greater degree of labor turnover than in nonseasonal industries. When relatively "new" employees are hired each year, they do not have a chance to become completely familiar with their surroundings. Furthermore, there is less opportunity and incentive for a sustained safety education program than in places with a steady and continuous work force. The fourth factor common to most high-rate industries is very important in logging—*shifting work sites*. The place of work for the employee is constantly shifting and the worker does not have an opportunity to become as familiar with the hazards as if he worked in a fixed place of employment.

While falling trees, limbs, or snags presented the greatest single threat to the lives of loggers, the *tools* they use exacted a greater toll in terms of nonfatal injuries.

Chain saws were involved in 158 of the 881 lost-time injuries recorded in logging in 1970—the largest number of injuries for any single agency. Saws which kicked back produced the most injuries—67. This usually occurred when the chain hung up in the cut or struck a limb or other object. Ninety-five percent of the kick-back mishaps led to cuts, lacerations, or puncture wounds. The other 5 percent produced strains, sprains, dislocation, or hernias. The major causes of chain saw injuries are listed in the table that follows.

Chain Saw Accidents, Logging, 1970

<i>Accident type</i>	<i>Number</i>
Total	158
Saw kicked back	67
Struck by falling, flying, branch, twig, splinter	31
Saw slipped while using	14
Strain in using, handling	13
Saw struck by branch	5
Saw slipped from grasp, n.e.c.	5
Worker slipped, fell with saw, n.e.c.	5
Hand slipped into saw	3
Chain jumped off saw	2
Other or type not stated	13

n.e.c.—Not elsewhere classified.

Other sources of fatal and nonfatal injury in logging are described in the Division's report on the industry. For those interested, a copy of the report may be obtained without charge by requesting *Disabling Work Injuries in Logging, California*, from the California Division of Labor Statistics and Research, P.O. Box 603, San Francisco, California 94101.

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new address.

OSHA Standards and Appeals Board Members Are Appointed

The members of the OSHA Standards Board and Appeals Board have been recently appointed by Governor Reagan. The Standards Board is responsible for setting safety standards for working conditions and places of employment in California. Following is a list of the new appointees:

Albert W. Turner

Chairman of Board, Supervisor of employee relations for Southern Cal Gas Co.

Gerald P. O'Hara

Asst. Director of Calif. Teamsters Legislative Council in Sacto.

Leo R. Westwater

Vice President & Secretary of Granite Construction Co. in Watsonville

Patrick J. Clancy, M.D.

Political Independent and specializes in occupational medicine

Dr. Harold V. Brown

Environmental Health & Safety Ofcr with Center for Health Sciences at UC in Los Angeles

J. Earl Coke

Former Secretary of Agriculture & Services Agcy., & former member of Gov.'s cabinet

William K. Stuckey

Secretary-Treasurer & Business Mgr. of Iron Workers of San Diego, Local 229

Members are elected to four-year terms. The Chairman is selected from the board members by the governor. The board meets monthly in various locations throughout the state. Meetings are open to the public and time is made available for new orders and order revisions to be proposed by anyone present.

The Appeals Board hears the appeals of employers who are contesting the issuance of a safety violation order, a fine, or safety compliance requirement. Their appointment is confirmed by the Senate and the Board members are appointed to four year terms. The chairman is selected from the members of the board by the governor. Following is a list of the members:

FORD B. FORD

Chairman of Board. He has been with Resources Agency

GERALD A. SHEARIN

Retired as Secretary-Treasurer of Teamsters Local 137

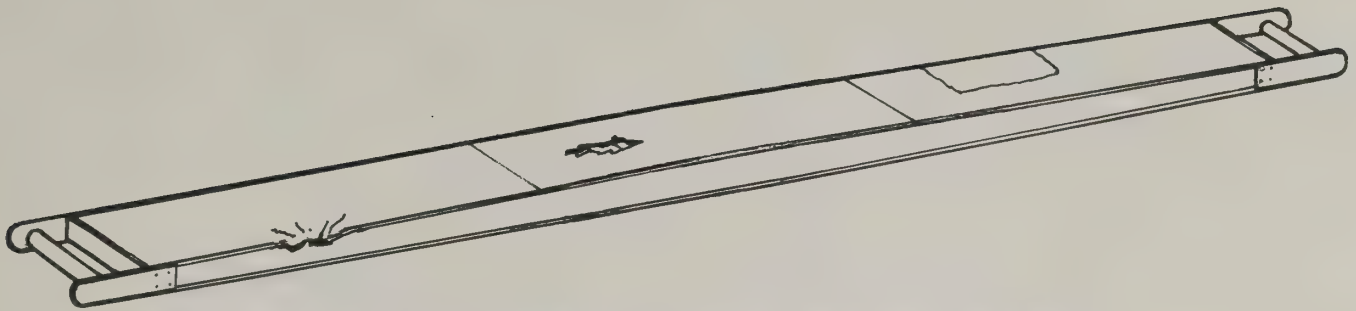
HERBERT MONROE BROWNE

Retired Businessman

7 Year Safety Record

The employees of the General Mills, Lodi, Processing Department, and their spouses met at the El Charro Restaurant to celebrate a record of working seven years without a lost-time injury.

The department has worked 1,440,549 hours to achieve this record. This is the longest recorded time that a Lodi Plant department has worked without a disabling injury.



ALUMINUM SCAFFOLDING — ITS MAINTENANCE AND USE

Modern industry has the benefit of a very useful and efficient tool. It is a lightweight scaffold plank constructed for long spans and easily handled by one or two men.

Basically the construction consists of light aluminum rail sections covered both sides with a thin plywood skin applied as a diaphragm. This skin can be as thin as $\frac{1}{4}$ -in. plywood in some planks. The connection of the skin to the structure is made so as to provide a complete transfer of compressive and tensile stresses to the end support points of the plank. This type of construction transfers about 80 percent of the applied load through the plywood skin covering to these support points.

It becomes apparent that any deficiency existing in the skin covering becomes a discontinuity in the pattern of stress transfer and results in a reduction of the allowable load. A break or puncture in the covering of 1 or $1\frac{1}{2}$ inches diameter becomes significant in reducing this allocable load.

The planks are generally 14 inches minimum width and the length varies to 24 feet. The plywood covering is continuous with a scarf joint and laminated with high-strength glue. Usually the diaphragm is fastened to the rail structure with rivets spaced closely to develop the maximum transfer of the compressive and tensile stresses to the end points. Any damage to the aluminum rail structure also reduces the strength of the plank.

Planks should be stored in such a manner that vehicles cannot run over them. They should not be stored or used in such a manner that the skin may be punctured by objects.

Planks of this type should never be loaded beyond the

rated capacity stated by the manufacturer. Repairs to this type plank are sometimes made without regard to maintaining the continuity of the diaphragm. Sections of the skin covering are sometimes removed and replaced by materials which are butt joined and thus provide a break in diaphragm continuity. These type of deficiencies are not apparent to the user and usually result in a sudden failure of the plank when the reduced capacity is reached. When improperly maintained, or repaired by other than the manufacturer, there exists a potential for a serious accident.

Most planks of this type are capable of longer strains than comparable length solid wood planks, but are limited in their load capability. Usually a limit of two men per plank is allowed. Lightweight aluminum planks of this type should never be used in a cantilever situation as the basic design is only for single span use with the plank acting as a simple beam.

When this type of plank is used in certain allowable locations, it is not conducive to the installation of the normal guardrail. Provisions in the California State Safety Orders allow for the use of safety belts and lifelines at elevations of 10 feet or higher above the ground or level below. In this instance the plank would be used as a ladderjack scaffold and the minimum width plank required is 14 inches.

When used properly and when the basic concept of this plank is understood, a proper margin of safety results for the workmen using this item.

Improper usage or damaged planks can result in a serious accident that, in most cases, could have been prevented.

EMERGENCY ASBESTOS STANDARDS

The emergency Asbestos Standards, which were adopted by the Division of Industrial Safety on March 30, 1973 (California Safety News, June 1973), were heard at public hearings on June 5 and 12, 1973, and were adopted as a permanent standard by the Safety Board on July 13, 1973.

As a result of comments made at these public hearings, some important changes were made. The new permanent regulations became effective August 25, 1973. The substantive changes are:

1. To the work practices in Section 5208(c) is added a requirement that "Asbestos waste, scrap, debris, and asbestos contaminated materials for disposal shall be collected and disposed in sealed, impermeable bags or containers."

2. Under "Change Rooms and Special Clothing," in Section 5208(e), paragraphs 2 and 3, are combined to make it clear that the lockers are required under the same exposure conditions that the change room is required.
3. Section 5208(g), "Monitoring and Record Keeping," was amended by adding the requirement that the employee be notified of exposure to excessive levels of asbestos within five days of the finding and also of the corrective action being taken.
4. Section 5208(j) (2) was amended by adding the requirement that a medical examination must be made available within 30 days of termination of employment, if such an examination has not been taken within one year of termination.

AIR COMPRESSOR EXPLOSION

A compressor was being installed in battery with another compressor that would discharge into a single air receiver. A stop valve installed in the line to the receiver tank was closed at the time of the accident. The compressor switch was turned on and the compressor made only a few strokes until it over-pressured the compressor head and a short section of the discharge piping. This resulted in a portion of the compressor head and piping exploding. The exploding object struck an employee in the face, about 8 to 10 feet away. He died some days later.

There was an acceptable safety valve on the existing air tank, which would have protected the high pressure stage of the newly installed compressor had the stop valve been open. In checking with the manufacturer of the compressor, it was found that this was an old model rated at 200 psi on the high pressure stage, with a free air capacity from 72½ cfm to 79 cfm, depending on whether a 20 or 25 HP motor was used with the package. The compressor was originally part of a package which did have a relief valve on the low pressure cylinder, with the high pressure cylinder protected by the safety valve on the tank, which was part of the package.

Generally all stages of compressors are protected with relief valves as required by General Industry Safety Order No. 3518. In this case the high pressure stage had no safety valve protection when the compressor was removed from the original package. An additional safety valve should have been supplied on the outlet of the high pressure stage.

All installers and operators of all types of compressors can protect themselves and their employees if they make sure that all stages are protected against over-pressure, using the compressor manufacturer's pressure ratings and capacities.

McKay Mitchell Dies at Age 68

Henry McKay Mitchell, a retired Senior Safety Engineer with the Division of Industrial Safety, passed away on October 3, 1973 at his Laguna Hills home in southern California. The cause of death was a respiratory ailment.

A graduate of the University of Utah, class of 1927, Mr. Mitchell took his degree in geological engineering. He worked for private industry and the U. S. Bureau of Mines before coming to the Division of Industrial Safety in 1943.

A civic minded man, he worked with the Orange County Safety Council and the Laguna Hills Safety Program. He helped organize the Episcopal Church Group in Laguna Hills, was an active Kiwanian, and a high Mason.

H. McKay Mitchell will be missed by all in the Division who knew him, especially those who worked with him during his many years of service.

CAL/OSHA QUESTIONS, PLEASE

A column will appear in the next issue of the California Safety News which will answer some of the questions readers have regarding the CAL/OSHA plan. Please send questions concerning CAL/OSHA to:

Division of Industrial Safety
Education and Research
455 Golden Gate Ave.
San Francisco, Calif. 94102

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SAFETY ORDERS for the State of California are procurable from Documents Section, P.O. Box 20191, Sacramento 95820. Check or money order made out to State of California must be enclosed. Sales tax if mailed to a California address, is required. Minimum sale is 50¢; on orders of 50 or more of same title there is a 10 percent discount. Stamps are not acceptable. For sale over the counter in Sacramento go to 714 "P" Street or 8141 Elder Creek Road (weekdays 8 a.m. to 5 p.m.).

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S-602—Liquefied Petroleum Gas Installation40
S-600—Boiler Report62
S-601—Unfired Pressure Vessel40

They Needn't Have Died

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
A welder was moving a 300-lb. switch cabinet when it fell over on his body and killed him.	Failure to obtain help to move cabinet.	Moving cabinet without help.	Never do a job alone when instructed to do otherwise.
An ironworker was tying steel on a column between two tilt-up panels 30 feet above ground level. Life line slipped off reinforcing steel it was attached to and he fell to the concrete floor below.	Hooked life line to open end reinforcing steel.	Improperly hooked life line.	Instruct workmen in proper hooking of life lines when working on column reinforcing steel.
Forklift operator struck a rock and lift overturned. He was pinned to the ground by the canopy.	Driving forklift over rock in roadway. No safety belt used.	Rock in roadway not removed.	Instruction to remove rocks from travel area. Always use safety belt.
An employee of an ice plant was using ice tongs to pull 300-lb. blocks of ice across the floor to load a trailer. Ice tongs failed to grab or pulled out as he moved backwards and he fell, striking his head on a block of ice 8 feet away. He died from a skull fracture and related injuries.	Failed to fasten ice tongs securely to block of ice.	Ice tongs not secured to block of ice.	Instruct workers to secure ice tongs on both sides of ice block and check before attempting to move block.
Operator of a plastic molding press failed to align platens, causing a shearing action on ram. The sheared piece flew from mold, striking operator. Death ensued.	Operating machine with misaligned platens.	Platens misaligned.	Install lengthened and tapered guide pins on molds and ram to provide alignment.
Ladle of molten steel bubbled over, spraying flux, slag and steel on laborer, causing burns resulting in death.	Ladle improperly cleaned and employee not wearing complete personal protective equipment.	Water or steam in bottom of ladle.	Provide written procedures for cleaning and inspection of ladles. Require use of complete personal protective equipment.
Warehouseman was pouring solvent from a 55-gal. drum into vat containing Acryloid when drum exploded. Burns resulted in death.	Failed to bond or ground drum.	No bonding or grounding of drum.	Always bond or ground drum containing flammable liquids before pouring.
Carpenter was assisting in removing form panels when panel fell and crushed his head against a fixed form panel.	Failure to brace or secure panel for safe removal.	Form panel not braced or secured before releasing top bonds.	Brace form panels prior to breaking bonds.
Truck driver was on loading hopper of a cement mixer helping to load. When operator raised hopper truck driver lost balance, fell backward 5 feet to asphalt pavement, striking his head fatally. Hard hat had fallen off.	Standing on hopper plus raising hopper without signals.	Hand signals not used and no guard on rear of hopper.	Require use of hand signals. Provide barrier at rear of hopper and secure hard hats to prevent their falling off.
Laborer was climbing on top of roll crusher and fell into feed opening causing his death.	Climbing over crusher feed opening of operating equipment.	Feed opening on crusher not guarded.	Properly guard feed opening on crusher.
An employee was wire-brushing inside of a cone crusher line suspended about 5 feet above ground by a wire rope. The weld broke on an eye attached to liner and liner fell on top of him.	Working under a suspended 1400-lb. liner.	Weld failed on one of the eyes attached to plate.	Install a third plate for lifting and use 3 separate lifting slings. Provide closer supervision.
A truck was loaded with 6 logs. The driver took off the binder and a loose log rolled off, crushing him.	Releasing binders before logs secured.	Log loose on load.	Provide a log lifter in place on truck before the binders are released.
A mechanic was cutting a panel loose and was using part of this panel for some of his support. He fell 22 feet, receiving fatal head injuries.	Using the panel for part of his support. Not using a safety belt and line.	Cutting panel without using a safety belt and line.	Train personnel in safe work procedures and use of safety belts and lines.
A tractor driver was attempting to pull a tractor out of the sand using a 30 foot chain connected to his tractor. The wheels of the pulling tractor stopped turning, causing the front of the tractor to rise, overturn and crush the driver between seat, steering wheel and body of tractor.	Point of attachment of chain was above the axle line.	Tractor not equipped with ROPS and seat belt.	Install ROPS and seat belts.
Driver fell from tractor and was run over by right rear wheel.	Moving out of driver's seat before setting brake or stopping engine.	Brake not engaged while stopped with engine running.	When stopping always engage brake or shut off engine.
Employee stood a 32 ft. 8 inch length of aluminum irrigation pipe on end to remove a piece of plastic gate inside and contacted a 12,000 volt power line.	Standing pipe on end under electric power lines.	Stacking of irrigation pipes under power lines.	Never stack irrigation pipes under power lines.

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CALIFORNIA SAFETY NEWS

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- 14 State Serial Numbers Identify Tanks and Boilers
- 15 They Needn't Have Died

CHIEFLY SPEAKING

Approval of the California OSHA Plan by the U.S. Secretary of Labor on May 1 was followed a month later by a Federal matching grant of \$4,993,-443 to help implement the Plan.

These two developments indicate that the Plan, as submitted under section 18 (b) of the OSHA Act, meets the Federal requirements of "equal effectiveness."

Equally important is the encouragement for us in California to proceed to implement the State Plan.

And that is just what we are doing, insofar as State laws and administrative regulations now allow.

In anticipation of full implementation of the Plan, the Division of Industrial Safety is quickly moving to:

- augment its staff of field engineers;
- open new district field offices and expand certain existing offices;
- revise procedures for workplace inspection;
- train staff in revised procedures;
- set up programs to inform the public about OSHA.

Insofar as DIS staff augmentation is concerned, recruiting and hiring have begun. Before the end of the 1973-74 fiscal year, 91 will be added to the field compliance staff, including 62 safety engineers, and 29 support clericals. Twenty-four will also be hired for the new consultative staff authorized for the first time by the State Plan. Initially this staff will comprise 18 safety engineers and 6 support clericals.

When the OSHA field staff is fully augmented, DIS will be capable of directing 203 professional safety engineers in the field, plus an augmented administrative and clerical support staff. This does not include staffing of



Richard Wilkins

continuing safety inspection programs not covered by the OSHA Plan, like those for elevators, pressure vessels, mines and aerial tramways.

The OSHA field staff will be backed up by 22 professional engineers in a newly-formed technical and staff services, together with the consultative staff and legal service.

Training of the DIS professional staff has been underway since early this year, with each safety engineer receiving up to 40 hours of instruction to orient them on the OSHA Plan.

As professionals are hired in the coming year, they will also be oriented to the State Plan and trained in the procedures to implement the Plan. Being emphasized in the training are the Plan's requirements for pre-inspection conference, inspection walk-through procedures, and the post-inspection conference and reports.

Training of the professional staff will be continuous, with the aim of developing the most effective corps of safety engineers in the U.S.

With this large, well-trained staff, DIS will concentrate on making their services and operations immediately available to workplace problems. To accomplish this, four new district offices—at El Monte, Van Nuys, Vernon, and Concord—have already been opened, and others will be opened as additional field engineers become available.

Established offices—at Santa Barbara, Ventura, Redding, Chico, and Modesto—are being expanded to accommodate larger staffs and to assure that field engineers are located where they are most needed.

In addition to staff augmentation, equipment for the field staff is also being secured with funds from the Federal grant. We mean to make sure that safety engineers have the specialized and technical tools to perform a thorough workplace inspection.

Staffing, training, and establishment of new field offices—these are preparations for full implementation of the OSHA Plan in California. We mean to be ready when final legislative changes are in effect, when DIS must implement its changeover to the OSHA system designed for maximum workplace safety and health.

RETURN OF THE STEAM LOCOMOTIVE

Joseph Olesiak, Senior Engineer
Pressure Vessel Unit, Division of Industrial Safety

The steam locomotive, once almost extinct, is making a slow comeback to the American scene. It may never again regain its number One position as the prime mover of people and freight but it appears destined to play a prominent role in many people's lives. Today, steam locomotive power is used primarily for pulling railroad cars on both private and municipally-owned railroad lines for the sole purpose of amusement for the public. I think it would be difficult to find a person who has taken one of these fascinating train rides that does not remember it fondly for years afterwards.

The first entrepreneurs in this business succeeded beyond their wildest dreams. Their success did not go unnoticed and soon more private railroad lines sprang up. Today there is a shortage of steam locomotives because most of them were scrapped about 30 years ago when they were removed from service. To have even a small unit manufactured today is not economically possible, except for the very wealthy. Hence, to satisfy the demand the world has literally been scoured in search of usable steam locomotives. They have been imported into California from Canada, Europe, and we have one that was salvaged from the jungles of an island in the South Pacific.

This influx of steam locomotives has created additional work for the safety engineers of the Division because the California Safety Orders require that all high pressure steam boilers used in a place of employment must be



A narrow-gauge German locomotive

Photo courtesy George and Robert Mohun

inspected and found to be in compliance with our regulations before a permit to operate can be issued. Under these regulations the locomotive boiler must be built to the standards of the American Society of Mechanical Engineers Power Boiler Code.

When we get an import from Germany, and recently we had two, we must determine if the boiler is both in good mechanical condition and if its design and construction will provide safety equivalent to that required by our standards. This necessitates converting the European system of measurement (meter, kilogram, second) to our system (foot-pound-second). In most cases this is not an easy task; however, despite the language barrier and metric system, we are able to accept these boilers for some given pressure with the assurance that they are safe.

Although the steam locomotive inspection is only a small part of the Division's overall safety program, it is a vital part and is given the same attention and thought as the many other activities of the Division—to insure that safety has been provided.

Pressure Vessel Inspection in California

The Division's Pressure Vessel safety program is considered on a national basis as one of the best in the United States, which probably means in the world.

In 1970, out of over 213,000 lost-time accidents in California, 683 were caused by boilers and pressure vessels and about 5300 others were due to related activities such as flarebacks, pipe failures and scalding. Out of a total of 750 fatalities from all causes, eleven were due to pressure vessels and objects in that category, which is less than 3 percent of the lost-time accidents and 1.5 percent of the fatalities.

Much of the credit for this low incidence should go to certified inspectors not employed by the Division. There are 281 of them employed by insurance companies, users such as oil companies and railroads, and the cities of Los Angeles, San Francisco, and San Jose. These inspectors are certified after passing a national test that is monitored by the Division.

Some objects, such as high pressure boilers, air tanks and LP-Gas tanks require state permits to operate. The certified inspectors take care of 77 percent of 14,000 boilers, 44 percent of 150,000 air tanks, and 9 percent of 18,000 LP-Gas tanks. Their reports for these objects constitute more than one-half of the clerical workload in the San Francisco Pressure Vessel Unit.

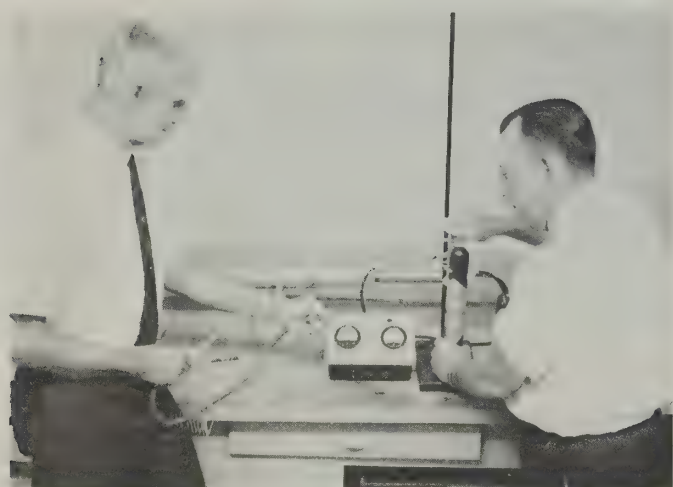
Another important function of the certified inspectors is making almost all of the inspections of low pressure boilers and of the many unfired pressure vessels that do not require State permits to operate. Usually Division Pressure Vessel engineers do not inspect these objects except upon complaint or request for help by the certified inspector in getting compliance. Approximately 1,100,000 objects would have no safety check if it were not for this cooperative system.

Film on Safe Lifting of Bed Patients

A new film of particular interest to hospitals has been added to the safety film library of the Division. It is, "Patience Lifting Patients."

In an informal setting a nurse explains to her friend that lifting of patients need not be a difficult task. In a hospital room actual techniques are demonstrated for hand lifting and lifting with mechanical devices, including shifting a patient in bed, moving patient to a wheelchair, to another bed, lifting him from the floor, etc. Teamwork effectiveness is stressed. With proper technique, no undue strain is placed on the back and back injury and fatigue do not occur. 22 mins.—Color.

INDUSTRIAL HYGIENE AND



Industrial Hygienists testing in the lab

**Peter S. Ellis, Vice President
Republic Indemnity Company of America**

Many workers in the field of safety, lacking knowledge or understanding, do not recognize the important role played by industrial hygiene in their work. The successful modern safety professional is a "jack-of-all-trades." He may or may not be a master of one or more. If he is of the vast majority, he will *not* be an industrial hygienist. He must recognize however, that industrial hygiene plays so great a part in today's industrial life, that he cannot successfully function in ignorance of its scope and influence.

The safety man of the first half of the twentieth century may have been professionally or academically trained. However, he most probably was not. He may or may not have had an industrial background. He usually did have some particular expertise. Within his limitations he functioned tolerably well. Fortunately, the demands upon him were not too great. Organized labor and the community were not particularly sophisticated in their demands for protection of the worker. Traditionally there was an assumption of risk on the part of every worker who entered the labor market. Enlightened employers understood the economics of accident prevention (including the field of industrial health), but the vast majority of employers were not enlightened in this subject.

New Problems

Today the picture is completely changed. A number of the areas of activity of the industrial hygienist have only recently had significance in general industry. Many of today's industrial health and safety problems were not dreamed of a generation ago. With today's concept of the safety professional, it is logical and indeed imperative, that the practitioner has at least a working knowledge of the terminology, and an understanding of the potential, of industrial hygiene.

The science of industrial hygiene is concerned with environmental factors or stresses that may cause employees to become partially or completely disabled. For convenience, they have been organized into groups as follows:

1. **CHEMICAL:** Treating of liquids, gases, dusts, fumes, mists and vapors.
2. **ERGONOMIC:** The study of biomechanics, human factors and fatigue.
3. **PHYSICAL:** Concerned with radiation, noise, vibration, temperature and pressure.
4. **BIOLOGICAL:** Involved with insects, molds, fungi, and bacteria.

In practical application, industrial hygiene is concerned with the total work environment. It considers the climate (including both temperature and humidity) within which we labor; the sounds to which we may be exposed; the light that we work by; chemical substances that we may encounter; radiation, an insidious menace to the uninformed layman, is a proper object of its study.

Expertise Required

The industrial hygienist may be called upon to measure, analyse, evaluate, recommend, report, testify, instruct, explain, interpret, prescribe and monitor, in any of the fields noted above.

He must be knowledgeable in the chemistry of commonly encountered substances and able to evaluate the potential perils of lesser known compounds, materials, and environmental situations. He will analyse air samples and measure the effectiveness of ventilation systems.

He is frequently the key figure in total hearing conservation programs. He will make sound surveys, perform analyses, and formulate recommendations for control of the exposures. He may perform and/or evaluate audiometric tests.

He may measure emissions of wastes and be called upon to deal with pollution control authorities.

The industrial hygienist frequently functions in the area between the safety engineer and the medical professional. He is concerned with the work environment; with the task and with employee efficiency; with job specification and with employee selection; with hazard control and with worker protection.

He may be called upon to assist with the planning of operations and facilities, or to consult with purchasing agents and vendors. In either case, he will be evaluating and advising upon exposures and controls.

He is often an expert among laymen, a resource person with much responsibility, but little or no glamor. He may become involved in industrial relations. He may be required to testify, from special knowledge, or as an expert witness, at workmen's compensation or other hearings.

He will usually be a management representative, either directly employed, or in a consulting capacity. He may be self employed and offering his services on a retainer or fee basis, or he may be employed by an insurance company, who offers his services to its policy holders. He may be employed by organized labor.

He will customarily consult with colleagues and acquaintances in his own and associated fields, thereby sharing his own experience and vicariously profiting from the experiences of others.

Members of the American Conference of Governmental Industrial Hygienists have developed lists of "Threshold Limit Values" and "Ceiling Limit Values," relating to many materials. When used by appropriately

THE SAFETY PROFESSIONAL

educated persons, these provide valuable guidelines for assessing potential or actual exposures and for providing successful measures of control.

The industrial hygienist is encouraged to volunteer his services, assisting in the formulation of these and other such standards. In this way he will be actively participating in upgrading the safety profession. He will also benefit many millions of workers by contributing to the knowledge necessary to ensure them a safe place of employment.

Team Approach

Consideration of the material presented in part one will indicate the multi-disciplinary nature of modern industrial accident prevention and employee health care. A team approach is called for. Members must be in good communication. They will be associated in their activities, although not necessarily working for the same employer.

Disciplines involved range from plant and industrial engineering through medicine and psychiatry. Included along the way, are workers in the fields of time and motion study, security, personnel administration, industrial relations, insurance, safety, industrial hygiene, health physics and nursing care.

Today's concept of employee safety and health has evolved slowly and from unlikely origins. The paternal-like relationships which were commonly encountered before the advent of the factory system of organized production, gave way to an era of impersonal and ruthless exploitation. This in turn provoked a two-pronged reaction. On the one hand came enlightened attempts at reform by employers, working through old-style "safety engineers" and culminating in organizations such as the National Safety Council. On the other hand came pressure from organized labor groups, in turn leading to the Williams-Steiger Occupational Safety and Health Act of 1970 (P.L. 91-956). On the way was produced a variety of degrees of involvement by the many state legislatures and other concerned authorities.

Workmen's compensation laws (which vary throughout the several states and are themselves under pressure to reform towards standardization); State and Federal Codes; Industrial and National Standards; all influence the type and amount of attention paid to the safety and health of workers. We now think in terms of the whole exposure, to environment as well as just to equipment; of all possible impairments and injuries, not limited to traumatic, but including industrial and industrially aggravated as well as industrially induced diseases and illnesses. Even of disability without injury or disease.

It is this very broad field of activity and involvement that necessitates a team approach and calls for effective communication between members of the various specialties. Safety and health practitioners are now meeting in joint conferences, witness the successful Western Industrial Health Conference, sponsored by no less than six professional societies and now in its 15th year.

Recognition of the multi-disciplinary nature of industrial accident prevention is inducing the American Society of Safety Engineers to change its image and ultimately its name. "American Society of Safety Pro-

fessionals" far better describes its more catholic membership, with the diversity of its activities.

The inter-relationship and the common involvement of the department of health, education and welfare, with the department of labor, in the Williams-Steiger Act, is another example of the submerging of artificial boundaries in this approach to a problem involving so much of humanity and in such a broad sense.

There is sometimes a tendency to think of industrial hygiene and the safety professional as being involved only with large, sophisticated manufacturing operations of high hazard. This is a mistake. They are also much concerned with safety and health factors in small manufacturing operations and in many non-manufacturing activities.

A recent study showed that two out of three industrial injuries, occurred in plants employing less than 100 people! It is also notable that, although "OSHA" record-keeping requirements booklets were mailed out to more than four million employers, only 11,500 of them employ more than 500 people!

Small Plants Covered

There is a demonstrated need for a broad, multi-disciplinary attack upon the problems of occupational safety and health in all places of employment. Special emphasis must be given to the smaller employer who until now has not received this attention.

President Nixon has spoken of "The Quality of Life" as being a major goal to be striven for at this time. Mr. George Guenther, Assistant Secretary of Labor and Director of OSHA, has coined the word "Protectivism" as being a quality as much to be sought after today, as "Productivism" used to be. Mr. Nader has effectively given much comfort and support to advocates of "Consumerism." This is an age in which the physical and mental well-being of the humblest individual is paramount. It would seem to be fully as important as production and profits.

The executive with safety responsibility, (and today this *has* to be a very important official) must be aware of, if not familiar with, the various techniques and disciplines that combine to ensure a safe working environment for his employees. This has to be dynamic knowledge. Modern manufacturing and operating techniques include many that were not dreamed of a generation ago. New materials and new processes continually present new hazards.

The safety professional is a special and responsible member of the management team. This is true whether he be a direct employee, a consultant, paid by fee, or provided by an insurance carrier. He has a special responsibility to become sufficiently familiar with the various techniques involved, together with the related activities and exposures, so that he can recognize and comprehend technical hazards and in turn properly present them to other management people.

He, too, is an interpreter of other people's findings. To do this successfully it is necessary that he fully understands those findings and has the ability to relate them properly to the total activity. Therefore, it follows too, that the successful safety professional, no matter what his initial background, should have a good working knowledge (among other subjects) of industrial hygiene.

ELECTRICAL SAFETY IN HOSPITALS

Richard Wilkins
Chief, Division of Industrial Safety

The electrical installation in a hospital provides safety and comfort to personnel who may be attending patients, as well as the patients themselves. A hospital electrical installation may be thought of as being made up of three basic parts.

First is the normal installation, which provides lighting and power to operate elevators and air conditioning. It also operates motor-driven equipment, such as pumps, kitchen appliances, and in some cases, is used to heat the hospital.

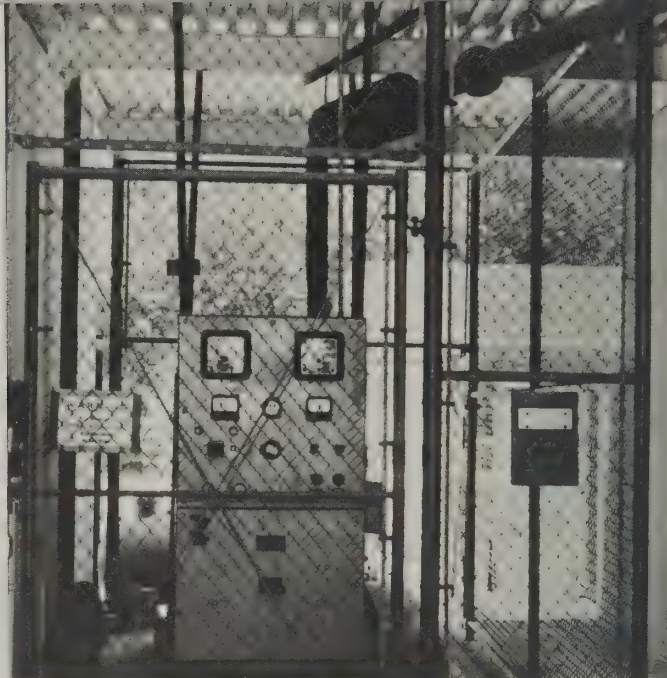
The second part may be thought of as providing life support. This part of the electrical installation may operate such items as vacuum pumps, incubators, and other vital equipment.

The third part would be classified as the critical electrical supply essential to keep a patient alive. This installation would include cardiac care, intensive care equipment, surgery, and other critical areas where patients are under close supervision.

In choosing the supply system to provide these types of services, it is important to consider the available sources. The size of the installation would be of major concern in this determination. In some cases, it is more economical to provide a low-voltage distribution system wherein low-voltage service is accepted from the serving agency. However, if the hospital is a large installation spaced out over large areas, there can be voltage drop problems that have a very distinct bearing on the safe operation of the equipment served. Also, the high cost of low-voltage distribution will dictate going to a high-voltage distribution system to provide an efficient and adequate supply where large amounts of energy are involved. A high-voltage distribution system introduces safety problems as to the method and equipment used to distribute this energy throughout the hospital to the unit substations where the transformation down to utilization voltages is made. The inherent hazards of high-voltage installations can be minimized by careful attention to the location of this equipment.

The location and access to the main service equipment and to the distribution system equipment are very important. These should be physically positioned in locations to minimize the possibility of physical damage from mobile equipment used in and about the hospital. In all probability, this would require the equipment to be located in a switchboard room which is limited to the electrical installation. Outdoor installation of the service equipment where it is subject to deterioration due to weather is not advisable for a hospital. In addition, it must be guarded against possible vandalism and operation by persons who are not competent or who may be intentionally trying to cause failure of the electrical supply system.

In today's planning, continuity of the electrical service must be considered in the physical location of the electrical equipment. A hospital electrical installation must be guarded against loss of the serving agency's normal supply. This important feature is resolved by choosing an emergency lighting and power system to act as a standby should the normal supply be interrupted. In



Emergency generator control box

choosing and sizing the emergency supply system, there is a need to consider the various services which are essential or critical to the patients' care in the hospital. If the emergency system is powered by a prime mover, the availability of fuel for the prime mover must be considered, and storage of a sufficient supply to carry those critical and essential services during the interruption period of the normal supply must be provided. If the hospital is heated by its own steam plant, there is always the possibility that the steam plant could provide prime steam for operating a turbine-driven generator. Otherwise, diesel or gasoline-powered generators would probably be a logical source.

Standby storage batteries probably would not be satisfactory to operate the hospital's critical and essential systems for any length of time, particularly if there is a need for a sizable amount of energy.

A relatively recent addition to California's electrical regulations is the requirement for a means of de-energizing the emergency system transfer switch completely for routine testing and maintenance. This bypass must be accomplished without disrupting or endangering the supply to the life support and critical systems.

With new developments in the industry, the protection for hospital personnel can be provided in the form of ground fault circuit interrupters providing individual receptacle outlet protection in the 15- and 20-ampere sizes. In addition, the main power supply can be equipped with ground fault protection. Since hospitals cannot interrupt the main supply for maintenance purposes, the electrician is more often than not required to make connections or do maintenance and service work with the circuits and equipment energized. If he should accidentally cause a fault to ground, the ground fault protection will take the system out of service before destructive arcing faults can occur. While this will not prevent him from receiving some injuries, it can provide protection against crippling and possibly fatal injuries. In order to limit and localize outages, there is a need to coordinate this protection with the feeder protection, and in some cases, the branch circuits also.

All hospitals should have a very good preventative maintenance program—not only well planned, but well executed to insure continued operation of all needed equipment. Regular inspection and testing should be per-

formed at frequent intervals to find evidences of pending failure of equipment normally used in the hospital. This would include such things as frayed cords on movable equipment, damaged prongs on attachment plugs, and possible breakage of cover plates over receptacles, as these would be the easily noted items which can cause injury if not found and corrected.

Scheduled testing of circuit breakers for proper operation and calibration should be done. A ground test should be run at regular intervals to insure that electrically operated equipment, such as hospital beds, vacuum cleaners, food carts, and the like are kept in a reasonably safe operating condition. There is a need to periodically arrange to bypass certain elements in the main switchgear for maintenance purposes. During this time, connections should be checked, insulators cleaned, and circuit breakers or switches checked to insure their proper operation. These programs are all needed to maintain a reasonably safe operating electrical installation.

At the time a hospital is being planned, it would certainly be advisable to include the hospital operating engineer in conferences held with the architect and consulting engineers. He is the practical man who must see that the hospital is operating properly and is maintained in a safe operating condition. If the hospital is not designed for efficient operation and maintenance, it will be difficult for the hospital engineer to insure those services necessary for the proper care of the patients and safety of personnel taking care of the patients. He should be included in the review of plans and drawings to express his views as to the location of the switchgear and transformers. Recognizing that these items can fail or need replacement, they should be installed in the building so he has access to either remove or replace such equipment.

Panelboards and other equipment, such as motor-driven machinery, must also be readily accessible so they can be reached quickly for maintenance purposes. It is also important that fixtures be so located that they can be relamped and cleaned easily and safely. Many hospitals have had electrical equipment with a short life expectancy so located that it is not accessible for servicing. The equipment may be concealed in furred ceiling spaces behind piping systems, ventilating ducts, or other impediments that prevent proper servicing or actually prevent service personnel from reaching the equipment. The resulting failure of a component has caused loss of use of an entire system.

Wherever possible, scheduling should be arranged so that circuits and equipment can be de-energized while work or servicing is being performed. Circuit disconnecting means should be locked in the open position and the circuit should be checked for voltage by the worker before work is begun. Wherever possible, a circuit disconnecting means should be installed within sight of the equipment it controls.

Working space must be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment.

Each disconnecting means and the equipment controlled shall be legibly marked to identify each with the other.

Following these common sense safety procedures can help provide reasonable safety for the worker in performing necessary servicing to insure proper operation of the various equipment for the safety of the patient.

Appointees to Safety Board



Leo Westwater



Dale Marr

Governor Ronald Reagan has announced the appointment of San Francisco labor leader Dale Marr and Watsonville construction executive Leo R. Westwater, to the Industrial Safety Board in the Department of Industrial Relations.

Marr replaces Virgil L. Collins of South Gate, and Westwater replaces Alan R. Bailey, of Los Angeles. The terms of both appointees had expired. The appointments are to four year terms and members receive \$28 per day while on official duty.

Marr, 56, a Democrat, is the vice president of Operating Engineers Local Union No. 3 in San Francisco, a 31-year member of the union, his duties are in the field of safety, training and negotiations.

He is on the State Advisory Council on Occupational Safety and Health and is a member of the executive committee of the National Safety Council.

Westwater, 71, is the vice president and secretary for the Granite Construction Company and also holds several corporate offices in related companies. A 1926 graduate of the University of California, he moved to Watsonville in 1930 and became Safety Engineer for Granite Rock, Central Supply Company, and Granite Construction Company, three related companies.

Ray Rodriguez Appointed Asst. Chief

Ray Rodriguez, veteran DIS safety engineer, has been appointed to the division's new position of assistant chief for technical and staff services.

Division Chief Richard Wilkins said the appointment was effective May 4.

Rodriguez has held the post on an acting basis since the new DIS section was created in May, 1972. The creation of a technical and staff services was part of a key reorganization that decentralized DIS and developed top management responsibility in the field, with the new technical and staff services providing expert backup for field operations.

Rodriguez is 59 years old and a native of San Francisco. He has extensive background as a technician in the elevator industry before joining DIS in 1949. He was appointed head of the DIS elevator section in November, 1952.





SAFETY AND AI

Milton O. Terry, District Ma

Round and round she goes, and where she stops nobody knows. Major Bowes Amateur Hour? No, but these wheels are still spinning the length and breadth of our fair state. In fact wherever people gather for fun, frolic, and relaxation. Of course that word relaxation hardly seems compatible with enjoying the thrills and excitement of amusement rides, but at least it is a release and change of pace from our normal hectic pursuits. What are we talking about? Why those gaudy, noisy, breathtaking mechanical contrivances that convey us over regular and/or irregular paths and dump us out at the end of a few minutes dizzy, starry-eyed, and looking for another ride that will leave us even more so. The carnival has come to town and all the kiddies from 8 to 80 are doing their best to test their endurance against the machine.

The question has often been asked "Are those things safe?" And the answer is generally yes, they are safe. Oh yes, accidents sometimes happen. Generally however this happens because a passenger bypasses a safety device like a gate or door or seat belt, or in some cases because something goes wrong due to questionable maintenance on the part of the operator. Since 1969 and 1970 this last has become a decreasing reason for injuries to riders of amusement rides in the State of California. In 1969 a new law was passed that required every amusement ride to be inspected by the State Division of Industrial Safety and/or other qualified City or County agency at least once each year. This law also required that a state permit to operate an amusement ride be issued annually.

At the time that this law went into effect it also required the Division to develop a set of safety orders for the design, construction, and operation of amusement rides. Public hearings were held and the orders adopted after meetings between the Division and the operators of rides as well as some of the manufacturers. The resulting orders are among the best in the nation, and have resulted in a vast improvement in the safety in design and maintenance of rides operating in this state. It is natural therefore that accidents because of equipment failure have been reduced in the past few years.

Since the state started issuing permits each ride has acquired a "C" number or state identification number. The first "C" number was issued in Indio in 1970 at the Date Fair to Steve Merten's Fiesta Time Shows. The number on that ride was C-10, as there were no single digit numbers issued. Since that time new permits have been issued to each ride every year. This year about 570 permits for amusement rides have been issued, over 200 for moving

carnival rides and over 360 for amusement rides on fixed bases in amusement parks. These figures do not include such places as Disneyland, Knott's Berry Farm, or the Board Walk at Santa Cruz which are each inspected and issued permits by the cities in which they are located.

Over the past few years since the permit system was inaugurated the general maintenance of amusement rides in California has improved each year. The first permits were issued with lists of requirements for correction of unsafe conditions mostly to do with maintenance or assembly defects. As the operators became more familiar with the orders and cooperation between the operators and State Safety Engineers improved there was less need for lists of requirements. Today as a general rule permits are not issued at all unless the ride will pass its initial inspection without evidence of unsafe conditions existing.

A by-product of this program has been a tightening up of safety standards by manufacturers of amusement rides. Safety devices have been added to some of the rides, and new standards for guard railing protection have been generally incorporated.

At this point in time it can generally be said, yes Mom or Dad the ride is safe for junior to go on and enjoy himself. A few words of caution though.

1. Please don't take or put small children on large, fast rides that are beyond their capacity to ride safely.
2. With real small children confine them to the Kiddie Rides which are designed with their small more or less uncoordinated bodies in mind. These rides will give the child amusement without buffeting them about and possibly injuring them.
3. Please see that you and your child understand that the gate, door, safety bar, or seat belt is there for your and their protection. It will be effective only so long as it is used and respected as a safety device.
4. Please see that you and your child do not engage in horseplay or any foolhardy stunts on an amusement ride. The ride was designed to give all the thrill that should be required with the passenger safely seated and restrained in the seating area of the ride.
5. Above all else wait for the ride to *stop* before attempting to get on or off the ride.
6. And last but not least get your hands out of the way when the ride operator closes the door or gate.

If you follow these simple rules, you and your children can ride and enjoy your day at the carnival without fear of injury or accident. Now step right up ladies and gentlemen and get the thrill of your life as this ride will spin you in every direction from center as you are lifted high above the Gay Way. Step right up I say, we only have a few seats left and it's first come first serve. That's all folks, wait for the next turn, this group is off and spinning.

AMUSEMENT RIDES

Division of Industrial Safety

ARTICLE 35. AMUSEMENT RIDES

3900. Purpose. These Orders establish minimum standards for design, maintenance, construction, alteration, operation, repair, inspections, assembly, disassembly, and use of amusement rides for the protection of persons using such rides. These Orders do not replace or supersede any existing Safety Orders affecting employee safety.

3901. Definitions. (a) "Amusement ride". A portable mechanical device which carries or conveys passengers along, around, or over a fixed or restricted route or course for the purpose of giving its passengers amusement, pleasure, thrills, or excitement. "Amusement ride" does not include the operation of articles of husbandry incidental to any agricultural operations or the operation of amusement devices of a permanent nature which are subject to building regulations issued by cities or counties and existing applicable Safety Orders.

(b) "Authorized person" is a competent person, experienced and instructed in the work to be performed and who has been given the responsibility to perform his duty by the owner or his representative.

(c) "Division". The Division of Industrial Safety of the Department of Industrial Relations of the State of California.

(d) "Public entity". Any city or county.

(e) "Registered engineer". An engineer qualified under the Civil and Professional Engineers Act (Chapter 7, commencing with Section 6700 of Division 3 of the Business and Professional Code, State of California).

(f) "Permit". An annual safety permit to operate an amusement ride, issued by the Division or by a public entity after an inspection of the ride.

(g) "Certificate of Inspection". An original certificate issued by the Division or by a public entity after certification in writing by a registered engineer that the amusement ride meets the requirements established by the Division for amusement rides. The certificate of inspection shall remain in force until voided by a modification of the ride.

3902. Manufacturer's Analyses. (a) For new model rides and for all existing models of rides for which this information may be requested, manufacturers, fabricators, or ride owner/operators shall furnish stress analysis or other pertinent data deemed necessary by the Division. Such stress analysis or other data pertinent to the design, structure, factors of safety, or performance characteristics shall be in such detail as to be acceptable to the Division. When such data on a particular ride is acceptable to the Division, it shall be deemed to apply to all rides of the same make and model where there have been no modifications.

(b) When no engineering calculations are available from the manufacturer or fabricator on a particular ride and when experience has been insufficient to warrant acceptance, the Division may require the owner/operator to furnish a structural analysis signed by a registered engineer.

Note: In evaluating rides where specific engineering specification data is lacking, the Division may not



require a structural analysis on slow moving rides such as, but not limited to, merry-go-rounds and kiddie rides where the basic design has been proven safe through years of operation. A permit to operate, however, will be required.

3903. Required Testing. Load tests or nondestructive tests of rides or component parts of rides may be required by the Division. Procedure for such tests shall be submitted to the Division and be acceptable to the Division.

3904. Emergency Brakes and Anti-Rollback Devices. If cars or other components of an amusement ride may collide upon failure of normal controls, emergency brakes sufficient to prevent such collisions shall be provided. On rides which make use of inclined tracks, automatic anti-rollback devices shall be installed to prevent backward movement of the passenger-carrying units in case of failure of the propelling mechanism.

3905. Speed Limiting Devices. An amusement ride capable of exceeding its maximum safe operating speed shall be provided with a maximum speed limiting device. All governors having an adjustable speed setting shall be sealed so that the adjustment cannot be changed without breaking the seal. If the seal is broken, the governor shall be readjusted and resealed by the ride foreman prior to replacing the ride in service.

3906. Signal Systems. (a) Signal systems which will warn operators against dispatching other passenger-carrying units in the event a previously dispatched unit has failed to clear an automatic stop shall be provided on all amusement rides where the lack of such a system may permit rear-end collision and injury to passengers.

(b) Signal systems for the starting and stopping of amusement rides shall be provided where the operator of the ride does not have a clear view of the point at which passengers are loaded or unloaded.

(c) Where the need for coded signals is indicated, any code of signals adopted for the operation of any amusement ride shall be printed and be kept posted at both the operator's and signalman's stations. Signals shall be thoroughly understood by all persons who use them.

(d) Signals for the movement of rides shall not be given until all passengers are safely within the conveyance and all persons are in the clear.

(e) Types of signal systems shall be tested at least once each day of operation and prior to the operation of the ride. Rides shall not be operated if the signal system is not functioning correctly.

continued on next page



Ferris wheel checkup

3907. Passenger-Carrying Rides. (a) The interior and exterior parts of all passenger-carrying amusement rides with which a passenger may come in contact shall be smooth, free from sharp, rough, or splintered edges and corners, with no protruding studs, bolts, screws, or other projections. Interior parts upon which or against which a passenger may be forcibly thrown by the action of the ride shall be adequately padded.

(b) Rides that are self-powered and that are operated by passengers shall have the driving mechanism so guarded and the guards so secured in place as to prevent passengers from gaining access to the mechanism. The "Dodge-Em" type of ride shall have the overhead screening free from holes that will catch the power conducting device and allow it to hang-up or cause a whipping action of the device.

(c) Belts, bars, footrests, and other equipment necessary for safe entrance and exit and for support while the ride is in operation shall be provided and maintained in a safe condition. Such equipment and the fastenings shall be of sufficient strength to retain the passengers.

3908. Passenger Restraining and Containing Safety Devices. (a) If, after inspection by an authorized representative of the Division, it is deemed necessary to install safety devices to prevent accidental or inadvertent dislodgement of a passenger from any tub, car, chair, seat, gondola, or other carrier, a restraining or containing device shall be installed.

(b) Passenger restraining or containing devices used on tubs, cars, chairs, seats, gondolas, and other carriers on a ride wherein the forces generated by the action of the ride require retention, restraint, or actual physical support of the passenger shall be designed, constructed, installed, and maintained to support the passenger safely. The fastenings shall be of a type which cannot be inadvertently released by the passenger or by any accidental means.

(c) Anchorages for required restraining devices shall have strength at least equal to the strength of the restraining device.

3909. Design and Construction of Supporting Structures. All supporting structures used in connection with amusement rides shall be designed and constructed to carry safely with the appropriate factors of safety as defined by the nationally accepted standards and with proper allowance for wind forces, dynamic effects of the equipment, load

reversals and repetitions all loads to which such structures may normally be subjected. All rides shall be placed on solid footings and be anchored to prevent shifting or tipping. Sandbags may be used on cement surfaces. Use of shim blocks shall be kept to a minimum. Depressions in the ground near the ride footings shall be filled and tamped and adequate means of drainage provided to prevent water from collecting and softening supporting areas in case of rain. The area surrounding the ride shall be cleared and kept free from trash and tripping hazards.

3910. Daily Maintenance. (a) An amusement ride shall be inspected and tested each day before it is to be used. The inspection and test shall be made by or under the immediate supervision of an authorized person.

(b) The inspection and operational test shall include the operation of control mechanisms, speed limiting devices, brakes, fastenings, and other equipment provided for safety, and the proper installation of safety devices as required by the General Industry Safety Orders of the Division.

3911. Assembly and Disassembly. (a) **Supervision.** The assembly and disassembly of an amusement ride shall be done by or under the supervision of an authorized person.

(b) **Quality of Assembly Work.** Assembly work shall be performed in a proper and workmanlike manner.

(1) Parts shall be properly aligned, and shall not be bent, distorted, cut, or otherwise damaged in order to force a fit.

(2) Parts requiring lubrication shall be lubricated in course of assembly.

(3) Fastening and locking devices shall be installed where required for safe operation.

(4) Makeshift devices shall not be used.

(5) All bolts shall fit the fastening holes and be equipped with proper nuts and lock washers.

(6) Where openings are provided for cotter pins, such pins, properly designed for use, shall be used and properly spread.

(7) All junction boxes shall be kept locked while in use.

(8) Where "U" bolt clamps are used for wire rope attachments, at least 3 clamps shall be used with the "U" bolts on the short or "dead" end of the wire.

(c) **Quality and Inspection of Parts.** Parts excessively worn or materially damaged shall not be used.

(1) Close visual inspection of parts shall be made during assembly to discover such wear or damage and inspection of fastening devices shall be made after assembly and before the ride is placed in service to assure that they have been properly installed.

(2) Where welding on rides or component parts is required, such welding shall be done by an experienced, competent welder.

(d) **Tools and Equipment.** Persons engaged in the assembly or disassembly of amusement rides shall be provided with and shall use tools of proper size and design to enable the work to be done safely. Broken, damaged, and unsuitable tools shall not be used.

(e) **Lighting of Work Area.** Assembly and disassembly of amusement rides shall be conducted under at least 5 foot-candle illumination.

3912. Control of Operation. (a) All amusement rides other than passenger operated or controlled rides shall be operated only by an authorized person. The operator shall be in the immediate vicinity of the operating controls during operation, even if automatic timing devices are used to control the time cycle of the ride, and no unauthorized person shall be permitted to handle operating controls during normal operation. All rides must have a stopping device within reach of the operator for use in case of an emergency.

(b) Each electrically driven ride shall have a disconnect switch within reach of the operator for use in case of an emergency.

3913. Public Protection. An amusement device shall not be used or operated while any person is so located as to be endangered. Areas in which persons may be so endangered shall be fenced, barricaded, or otherwise guarded against public intrusion.

3914. Required Inspections. (a) Each amusement ride shall receive certification in writing by a registered engineer that it meets the requirements established by the Division.

Note: If the manufacturer of an amusement ride submits to the Division an accepted stress analysis for such ride certified by a registered engineer, the Division may, upon inspection of the ride, issue an original certification of inspection.

(b) The original certificate of inspection shall not be issued for any amusement ride until certification has been made and filed with the Division. The certificate of inspection and the certification will become void if the device is rebuilt or modified in a manner that will affect the structural design or strength.

(c) A registration number shall be obtained from the Division and will be issued with the original certificate of inspection and this number will remain in effect until the engineering certification is voided by modification.

3915. Issuing of Permits. (a) On or before March 1 of each year, the owner or operator of an amusement ride shall apply for a permit to the Division or a public entity on a form furnished by the Division. Upon receipt of the inspection forms and certification that the ride complies with the rules and regulations of the Division and upon receipt by the Division or a public entity of the required inspection and permit fees, the Division or a public entity shall issue a permit to operate the specific ride which has been inspected. No permit to operate issued by a public entity shall be valid until a copy of such permit and the inspection report has been filed with the Division of Industrial Safety.

(b) No person shall operate an amusement ride unless a current permit to operate has been issued by the Division or a public entity as prescribed in Division 5 of the California Labor Code, Part 8. However, an amusement ride inspected and covered by a valid permit to operate in the preceding year may continue to operate until further inspected, providing the owner/operator of the ride has made written application to the Division for an inspection at least ten days prior to its operation indicating where such ride will be available for inspection and the application remains unacted upon. The permit to operate will become void immediately in the event of a fatal, dismembering, or disabling injury to one or more persons as the result of failure or malfunctioning of the ride or any of its mechanical components.

3916. Inspection and Permit Fees. The following fees will be charged by the Division for inspections and services rendered by Safety Engineers employed by the Division.

(1) Original certificate of inspection—\$15.00.

(2) Modification of original design which results in revised certificate of inspection—\$15.00.

(3) Annual reinspection permit—\$15.00.

(4) Inspection of altered or materially changed rides—\$12.00 per hour or any fraction thereof.

(5) Investigation of accidents resulting in major damage to ride—\$12.00 per hour or any fraction thereof.

(6) Investigation of fatal, dismembering, or disabling injury occurring to a member of the public—\$12.00 per hour or any fraction thereof.

(7) Other inspections and investigations—no charge.

3917. Posting of Permit. All permits, except the original certificate of inspection, issued by the Division or a public entity under authority of the Labor Code of the State of California shall be kept with the ride in a protected place and shall be readily available.

3918. Identification and Rating Plates. Each amusement ride shall be identified by a registration number, the name and address of the manufacturer (if known), a trade or descriptive name, and model or serial number (if any), the maximum number of passengers, and the maximum safe speed. The required information shall be legibly impressed on a metal plate or equivalent and readily visible and legible at all times.

3919. Rebuilt and Modified Devices. If an amusement ride is to be altered after issuance of the original certificate of inspection or if the ride is to be so modified as to change its original action or motion pattern, the following shall be done:

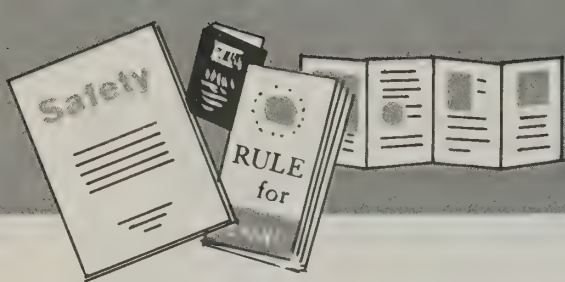
(a) The owner shall notify the Division of such action before proceeding with the change. Certification of a stress analysis covering the proposed changes signed by a registered engineer shall be provided to the Division. Changes relating to operational safety of the device shall be acceptable to the Division.

(b) A revised certificate of inspection shall be obtained.

3920. Accident Notification. All accidents involving the public resulting in a fatality, dismembering or disabling injury, or accidents resulting in major damage to a ride must be reported to the Division's San Francisco or Los Angeles office within 24 hours of occurrence.

Inspecting "Helicopter" ride





PUBLICATIONS AVAILABLE

The following bulletins and placards are available without cost by writing to the Division of Industrial Safety, Education Unit, 455 Golden Gate Avenue San Francisco, Ca. 94102 or 3460 Wilshire Boulevard Los Angeles, Ca. 90010 or other Division offices.

BULLETINS

S-103 "Safe Handling of LP Gas" gives the use and characteristics of LP gas and rules for safe handling.

S-108 "Taming the Circular Saw" deals with a useful but dangerous tool.

S-109 "Safety Films Available from the State Division of Industrial Safety."

S-110 "Tips for Hotel Workers" is a guide to safety in hotel work.

S-111 "Farm Safety Check List" is a safety guide for everyone on the farm.

S-117 "Stop Grinding Out Injuries!" describes abrasive wheel precautions.

S-120 "Safety Rules for Painters" shows how to prevent injuries to painters.

S-122 "Handy Rules for Hand Tools" describes the proper care and use of many common tools.

S-123 "Three Steps for the Safe Use of Portable Ladders" explains how to avoid ladder accidents.

S-124 "Safety Rules for Roofers" alerts to dangers and gives precautions against slips and falls, tar burns, strains and ladder injuries.

S-125 "Are You Using Carbon Tet?" deals with a hazardous chemical.

S-127 "Look Out for Yourself When Around Crop Spraying" is directed to farmworkers. (Also available in Spanish.)

S-128 "If You Work in a Quarry" covers quarry and open-pit mine workers.

S-137 "Skin Trouble Is Plenty Trouble" deals with the most common disease you can get at work.

S-141 "Power Hand Saw Safety" gives causes of power hand saw injuries.

S-142 "Live With the Label" cautions users of hazardous substances.

S-143 "Trade Association Safety Programs" reveals their value.

S-145 "Safety Publications Available from the State Division of Industrial Safety."

S-146 "Safety in Pipeline Construction" tells how to plan and organize pipeline jobs and how to insure safety in various phases of the job.

S-148 "The Safe Use of Aqua Ammonia in Agriculture" describes necessary precautions for safe use of aqua ammonia.

S-154 "The Tailgate Safety Meeting" gives pointers on effective means to promote on-the-job safety.

S-157 "Guard Standards No. 2—Stairways and Railings" gives requirements for stairways, railings, entrances to stairways, and floor and wall openings.

S-160 "Confined Space Can Be a Death Trap!" Describes hazards of work areas where poisonous gases can build up or oxygen be lacking—sewers, tank cars, vats, shafts, barges, silos, etc.—and what to do about this danger.

S-802 "Lock Out Block Out" tells how to safely lock out or block out machinery or equipment.

S-803 "Standard Whistle Signals for High Lead Logging" gives complete set of signals.

S-804 "Fork Lift Truck Operation" safety and common sense in material handling by fork lifts. States rules and gives accident prevention tips.

S-806 "Hand Lifting" safety and common sense in material handling through correct lifting techniques.

PLACARDS

S-101 "Safe Handling of LP Gas" gives safe procedures for handling and installing LP gas units. (5½" x 8½")

S-611 "Construction Hoisting Signals" gives bell or whistle signals required by the Construction Safety Order 1612(c). (5½" x 7")

S-612 "Notice! Fuse Used Here Burns at the Rate of One Foot in — Seconds." (8½" x 11")

S-615 "Stop Machinery Before Oiling, Cleaning, Repairing." (8½" x 11")

S-617 "Wear Goggles. You Can Get Used to Goggles—But Never to a Glass Eye." (8½" x 11")

S-627 "Caution! Don't Go Between Brow Log and Load. Don't Dump Logs Until All Men Are Clear." For use at log dumps and ponds. (8½" x 11")

S-800 "Hand Signals for Boom Equipment Operation" shows approved arm and hand signals in diagrams. (8½" x 11")

S-801 "The ABCs of Safety" is an amusing alphabet in which every letter relates to safety. (8½" x 11")

S-807 "Emergency Numbers for this Project—Ambulance, Fire-Rescue, Police, Hospital." (8½" x 11")

S-809 "Safe Practice for Mounting and Inflating Tires with Split Rim and/or Retainer Rings." (8½" x 11")

S-810 "Safe Practice for Mounting and Inflating Passenger Car and Other Drop Center Wheel Tires." (8½" x 11")

STICKERS

S-616 "Warning—This machine is automatically controlled and may start at any time." (3" x 5¼")

S-658 "Remember! This guard is here for your protection!" (3" x 5¼")

S-808 "Blasting Signals" Warning, Blasting, All-Clear signals. (3" x 5¼")

Safety Orders Available

While the Division of Industrial Safety distributes many free brochures and other safety information the Safety Orders are available only in Sacramento and there is a small charge made to cover printing costs.

Safety Orders of the State of California are available from Office of Procurement, Document Section, P. O. Box 20191, Sacramento, California 95820.

All sales are subject to payment in advance. Money orders or checks should be made out to State of California. Add 6 percent sales tax for California addresses. There is a 10 percent discount on orders of fifty (50) or more of same title. Minimum sale is 50¢ and stamps are not acceptable.

Price List

CALIFORNIA SAFETY ORDERS	WITH SALES TAX	
Aerial Passenger Tramway Safety Orders	\$0.75	\$0.80
Boiler and Fired Pressure Vessel Safety Orders .....	.75	.80
California Shaft Bell Signals (on oil cloth)	1.50	1.59
Compressed Air Safety Orders .....	.75	.80
Construction Safety Orders	2.00	2.12
Electrical Regulations (See Title 24, Part 3, below) *		
Elevator Safety Orders	2.00	2.12
General Industry Safety Orders	2.00	2.12
Logging and Sawmill Safety Orders	2.00	2.12
Mine Safety Orders	1.00	1.06
Petroleum Safety Orders, Drilling and Production	1.50	1.59
Petroleum Safety Orders, Refining, Transportation and Handling	1.50	1.59
Ship and Boat Building Safety Orders .....	.75	.80
*Title 24, Part 3 (Basic Electrical Regulations)	7.00	7.42
Tunnel Safety Orders	1.00	1.06
Unfired Pressure Vessel Safety Orders	1.25	1.33
Window Cleaning Safety Orders	1.00	1.06
INSPECTION REPORT FORMS (price listed is per pad of 50 forms)		
No. S-152—Elevator Inspection Report ....	.57	.61
No. S-217—Elevator Reinspection Report ..	.35	.37
No. S-600—Boiler Report .....	.62	.66
No. S-601—Unfired Pressure Vessel Report .....	.40	.43
No. S-602—Liquefied Petroleum Gas Installation Report .....	.40	.43

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new address.

NIOSH Requests

INFORMATION ON TOXIC AGENTS

Health, Education, and Welfare's National Institute for Occupational Safety and Health (NIOSH) has issued a public request for relevant information not readily available in the open scientific literature on 10 potentially toxic substances. The request, made in the November 10, 1972, edition of the Federal Register, is intended to assist NIOSH in the development of criteria for recommended standards under the Occupational Safety and Health Act.

The substances listed in the request are:

1. Acetone.
2. Aniline.
3. Copper and copper compounds.
4. Cyanides.
5. Methyl chloride.
6. Methyl ethyl ketone.
7. Methyl isobutyl ketone.
8. Nitrous oxide.
9. Styrene.
10. Zinc and zinc compounds.

Information received concerning any of the preceding substances will be analyzed relative to the following general areas: (1) establishment of safe exposure levels and safe work practices; (2) establishment of biological standards; (3) engineering controls; (4) specifications for personal protective equipment; (5) methodology for air sampling and analysis; (6) medical examination needs, including diagnostic tests; (7) procedures for controlling workplace environment; (8) types of recordkeeping required; and (9) warning devices and labels. Information or data on these and/or other relevant points should be submitted to: Assistant Director for Research and Standards Development, National Institute for Occupational Safety and Health, Room 10-28, 5600 Fishers Lane, Rockville, Maryland 20852. . . . This information is relevant at any time.

VIIth World Congress

The Seventh World Congress on the Prevention of Occupational Accidents and Diseases will be held in Dublin, Ireland from May 20 to 25 in 1974. If you are interested in the Congress and wish to receive further information, write to VIIth World Congress, Ansley House, Dublin 4, Ireland.

Safety Device Prevents Disaster

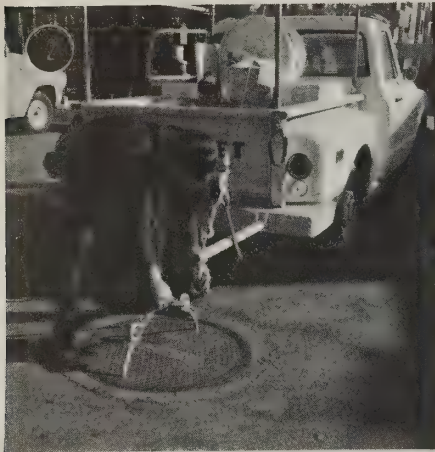
This is a story of an accident that didn't happen.

The manager of a local steak house told a State safety engineer, "Last week I saw water pouring off the roof. It was hot water. I found the thermostat to the storage water heater stuck, and boiling water blowing out that pipe. We replaced the thermostat."

The safety engineer pointed out that if a pressure relief valve had not been installed on the tank it could have exploded with the force of about 5 pounds of black powder. It could have wrecked the building and possibly set it afire. It would have killed employees and patrons. It didn't happen.



1—Positioning Lifting Device



2—Hooking on to cover



3—Lifting manhole cover



4—Swinging cover aside

"My Aching Back!"

Al Keller, Fire Prevention Inspector at the University of California, Santa Cruz, uttered the title words when he was lifting the 200–250 lb manhole covers of the University underground wiring system. To provide proper maintenance and tests of the wiring system several of these heavy cast steel covers must be removed each month. Mr. Keller decided his back would "wear out" before the covers and an easier way to lift them was needed.

Utilizing the University's shop equipment and a few inexpensive parts (about \$20 worth) Mr. Keller designed and constructed a lifting device that is mounted on a pickup truck whenever manhole covers are to be lifted. This takes about 10 minutes.

STATE SERIAL NUMBERS IDENTIFY TANKS AND BOILERS

The Division of Industrial Safety sometimes helps to recover stolen property. State serial numbers are assigned to each air tank, LP-Gas tank and high pressure boiler that requires a State permit to operate. This unique number is usually center-punched near the manufacturer's nameplate. Whenever an object is stolen, a note is added to that individual file. If the object returns to service elsewhere in the State, the new inspection report shows the location of the object.

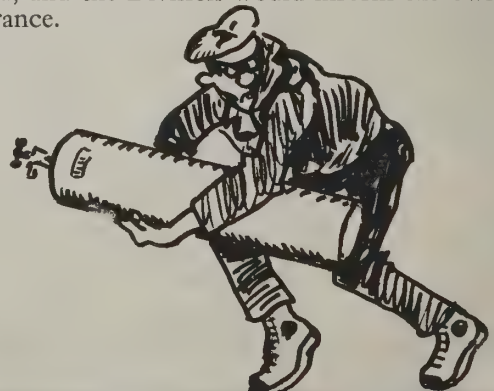
In one case, the recovery of a portable air tank resulted in the conviction of a judge and a handyman for arson and theft. The stolen tank had been given by the judge to the man for burning a building for him. Upon inspection for a permit to operate, it was found that the tank had been stolen. The State number was considered as absolute evidence of the identity of the tank.

In another instance, a construction company reported a tank stolen and filed an insurance claim. Months later that insurance company inspected a tank at another job site of the same construction company. One of the job foremen had simply moved the tank from one place to another, and no theft was involved.

State numbers have also been useful in identifying

LP-Gas tanks which had been swept away in floods.

In a recent case a boiler manufacturer reported a boiler stolen from a warehouse. No state number had been assigned yet. The National Board of Boiler and Pressure Vessel Inspectors sent a description and the manufacturer's serial number to all State authorities. Should this boiler ever be used in California, identification would be made at the first inspection when the State serial number is assigned, and the Division would inform the owner of its appearance.



They Needn't Have Died

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
A driver was traveling on a two-lane avenue when an oncoming motorist crossed the center stripe and hit him head on.	Crossing the center stripe by other driver.	Failure of driver to avoid collision course.	Instruction in defensive driving techniques.
An operator was pressurizing a retort with steam when an excessive amount of steam was leaking past the door seal. Door blew open, engulfing the operator with steam. The burns caused his death.	Failure to properly secure door before pressurizing retort.	Door holding elements not fully engaged in locking position.	Always properly secure door and check gaskets for leaks before pressurizing retort.
A track maintenance man was walking across the tracks with his head down. He was struck by switch engine that tossed him into a ditch.	Failure to look for trains before entering track zone.	Preoccupation; lack of awareness.	Never cross railroad tracks without looking both ways for trains.
A logger cut a tree but it didn't fall. He started to undercut another tree when the first tree fell and killed him.	Failed to carry wedges to fall cut tree.	Working in area of cut tree.	Always fall a cut tree. Have tools on job site.
A welder was moving a 300-lb. switch cabinet when it fell over on his body and killed him.	Failure to obtain help to move cabinet.	Moving cabinet without help.	Never do a job alone when instructed to do otherwise.
A ranch hand was operating a tractor on a steep slope. Tractor slid backwards over a bank and flipped over backwards, killing him.	Working on too steep a slope near a slough bed.	No roll-over protection on tractor.	All agricultural tractors should have roll bars and seat belts.
A laborer was working in a 7-foot, unshored trench. Trench caved in, killing the man.	Trench was not shored before work was started.	Unshored trench.	Shore trench before starting work in it.
A bus driver was walking across parking lot when he was hit and killed by a bus that was backing up.	Driver of bus failed to see pedestrian who did not keep clear of bus.	No back-up lights on bus or flagman present.	Install back-up lights on bus and provide a flagman. Honk horn and use rear view mirror.
A conveyorman fell or slipped into a sand surge pile and was buried.	On top of surge pile without safety belt and secured lifeline or another worker present.	On top of surge pile	Never walk on a surge pile unless using a secured lifeline and safety belt, and having another person standing by.
A mechanic was cutting top off a 55-gallon oil drum with an acetylene torch and the drum exploded violently.	Using acetylene torch on drum before inerting.	Flammable contents in drum.	Purge, flush out any drum or container that is to be cut with an acetylene torch.
Truck driver climbed to top of lumber load on semi-trailer truck in rain.	Climbing up on load of truck in the rain.	Wet work surface during rain; slippery conditions.	Use a ladder or work platform to get to the top of a loaded truck.
Tractor driver was pulling loaded trailer with tractor. Trailer became disconnected and rode up over tractor. Tongue of trailer crushed driver against tractor, killing him.	Trailer tongue not properly secured to tractor.	No safety chain attached to trailer tongue and tractor.	Always check equipment for defects, properly secure and attach safety chain.
Employee working in field on a cold day was warming himself by an open fire. His clothes caught on fire causing his death.	Standing too close to the open, wood-fueled fire.	Wearing polyester blend pants that are very flammable.	Wear cotton work clothing and never stand too close to an open fire.
Laborer was straightening and stacking cases of empty bottles to a height of 7 feet. Unstable stack started to fall and he tried to hold stack. Top case fell off, striking his head.	Working too close to unstable stacked cases.	Bottle cases stacked improperly.	Provide for stable stacking and storage procedures. Workers must wear head protection where there is danger from falling objects.
An employee was holding a drive belt in place to put it back on the pulley. A production foreman turned on the motor to drive the belt on the drive wheel. The employee's arm was caught between belt and drive wheel and he was dragged around the drive shaft.	Attempting to drive belt onto drive wheel by starting motor.	No lock-out procedure; working on energized equipment.	Establish proper installation and lock-out procedures. Use maintenance men to replace belts.
A mechanic was welding a plow. A spark caused a can of gasoline to explode, burning him to death.	Welding near a 5-gallon container of solvent.	Flammables stored in an area near spark-producing equipment.	Remove all containers of flammables from work areas and place in flame-proof storage areas.
A steel erector was standing on web of I beam truss lifting a purlin to bolt onto truss. He raised his head and contacted a 12 KV line and was electrocuted.	Working within 30 inches of energized 12 KV line.	Structure built to within 10 inches of KV line.	De-energize 12 KV line and relocate the line a safe distance from structure.
Operator was moving material with fork lift. Spindle broke on left side of steering axle causing fork lift to lie on its side. The operator was pinned to the ground.	Operating equipment without safety belt.	Proper maintenance of fork lift.	Provide for proper maintenance. Install a safety belt and require its use.

Offices of the Division of Industrial Safety

MAIN OFFICES

SAN FRANCISCO.....455 Golden Gate Ave. 94102 415-557-1946
Los Angeles.....3460 Wilshire Blvd. 90010 213-381-1332

REGIONAL OFFICES

Fresno.....2550 Mariposa St. 93721 209-488-5302
Los Angeles.....3460 Wilshire Blvd., 90010 213-381-5695
Sacramento.....714 P St. 95814 916-445-5818
San Diego.....1350 Front St. 92101 714-236-7325
San Francisco.....1540 Market St. 94102 415-557-1677

DISTRICT OFFICES

Bakersfield.....225 Chester Ave. 93301 805-324-6437
El Monte.....9537 Telstar Ave. 91731 213-572-6965
Long Beach.....230 E. Fourth St. 90812 213-432-8443
Modesto.....1800 Coffee Rd. 95355 209-529-7751
Oakland.....1111 Jackson St. 94607 415-464-0660
Redding.....1421 Court St. 96001 916-246-1621
Salinas.....21 W. Laurel Dr. 93902 408-449-7235
San Bernardino.....303 W. Third St. 92401 714-383-4321
San Jose.....888 N. First St. 95112 408-277-1260
San Mateo.....2555 Flores St. 94403 415-573-1718
Santa Ana.....28 Civic Center Plaza 92701 714-558-4141
Santa Barbara.....5276 Hollister Ave. 93111 805-966-2918
Santa Rosa.....750 Mendocino Ave. 95404 707-542-8802
Stockton.....31 E. Channel St. 95202 209-948-7762
Van Nuys.....8155 Van Nuys Blvd. 91402 213-782-1800
Vernon.....2833 Leonis St. 90058 213-589-5848

FIELD OFFICES

Chico.....125 W. Third St. 95926 916-343-5182
Eureka.....619 Second St. 95501 707-442-5748
Ukiah.....264 E. Smith St. 95482 707-462-8850
Ventura.....3418 Loma Vista Rd., 93001 805-642-1475

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SUTRO TOWER ELEVATOR . . . page 8

STATE OF CALIFORNIA
Ronald Reagan, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
H. Edward White, Director

DIVISION OF INDUSTRIAL SAFETY
Richard Wilkins, Chief

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H. E. White takes over as New Director of D.I.R.



H. Edward White has taken over the reins of the State Department of Industrial Relations. Governor Ronald Reagan's appointment of the new Director was effective December 1, 1972.

Mr. White replaces William C. Hern who resigned last August. George W. Smith, who had been interim Director during the 4-month period, has resumed his position as Deputy Director.

Mr. White has a broad background in personnel and industrial relations work. He has been an agent with the Federal Bureau of Investigation. When appointed by the Governor, Mr. White was corporate director of Hydril Company in Los Angeles, an oil field equipment manufacturer. He also has been active with the Volunteers of America in Southern California, in particular with their rehabilitation programs for the indigent.

A native of New Jersey, he graduated from St. John's University and received a bachelor's degree in business administration. He holds a master's degree from New York University.

Mr. White recognizes the Department of Industrial Relations has responsibility for some of the most significant programs in State government and he is proud to be associated with the programs and the Departmental staff. In accepting the position, he stated, "I want to do a good job for management, labor and the public. I consider the job challenging and stimulating."

STATE OSHA PLAN APPROVED

The U.S. Secretary of Labor approved California's occupational safety and health plan on May 1, 1973.

The plan was submitted by the state under the provisions of the Federal Occupational Safety and Health Act of 1970.

In announcing the approval Governor Ronald Reagan said the state's workers are assured "ongoing and even better protection of our working men and women." The Governor commended all those who worked for a year and a half to mesh federal criteria with the state's existing industrial safety program which he called "a model for the nation."

The state plan originally was submitted to the regional office of the Occupational Safety and Health Administration (OSHA) in September, 1972 and was resubmitted in December after being returned for modifications.

Under the terms of the federal act, state safety engineers (compliance) will enforce state industrial health and safety laws. After a transitional period of three to four years, the state will assume complete jurisdiction. In that time the U.S. Department of Labor will provide close coordination with the state to avoid duplication of enforcement and to help the state programs achieve equal effectiveness called for by the federal Williams-Steiger Act.

Approval of the plan also made the state eligible for 50 percent federal funding of its occupational safety and health activities. Application already has been made for a \$5 million grant.

Legislation has been introduced both in the Assembly, by Assemblyman Jack R. Fenton (D-Montebello), and in the State Senate by Senator Fred Marler (R-Redding) to implement provisions of the state plan.

If You Move—

If you move, and wish to continue receiving the CSN, please notify us of your new address.

CHIEFLY SPEAKING

State Safety Chief Previews OSHA



Richard Wilkins

The State Division of Industrial Safety has one charter—to enforce California job safety laws and regulations.

As Chief of Industrial Safety, I am committed to safety enforcement in a fair, firm, and non-partisan manner.

Both our basic charter and the manner of its enforcement, consequently, force us to walk a tightrope. We can rarely please everyone. There are always complaints that we should do more or that we should do less.

No one questions that safe and healthful working conditions are in everyone's best interest; and everyone agrees that job injuries and deaths must be reduced and, ideally, eliminated. But in our attempts to do just that, we raise special concerns and highly partisan issues.

I do not ask for a holiday from disagreement. The issues literally involve life and death, and the disagreements mirror everyone's concern over the vital issues. However, the State is now about to reorganize industrial safety programs, probably the most radical changes since 1917, and the knowledge, understanding and cooperation of everyone are necessary for our new programs to succeed.

The State's administration of the Federal Occupational Safety and Health Law, under a plan submitted for approval of the U.S. Secretary of Labor, will partially end the dual jurisdiction of Federal and State agencies which has prevailed since April, 1971.

The State Plan, prepared under indices and tests of equal effectiveness specified in the Williams-Steiger Act (OSHA), will change the orientation of DIS. Under OSHA, we shall minimize the persuasive, soft-sell approach that has been our mainstay for many decades. OSHA requires enforcement and compliance. This means DIS field safety engineers must make compliance inspections of workplaces, and we must legally cite every violation. Financial penalties for violations are fixed, as presently required by OSHA.

A special procedure for appealing sanctions is an important part of the California Plan. An independent OSHA Appeals Board, separate from DIS, will review and act upon appeals from DIS actions.

Adoption of safety and health standards will also be vested in an agency separate from DIS—the Occupational Safety and Health Standards Board of seven members.

Unlike the Federal OSHA programs, however, the California Plan provides for consultative services to employers to help them comply with job safety and health laws. Since this service will be separate from an actual compliance inspection, it will not involve immediate penalties.

California will also expand its educational programs much beyond those called for by the Federal law. We shall also keep management and labor fully informed of

the Plan and our administration of it, as well as informing them of how to comply with the standards promulgated.

DIS has been gradually gearing up to administer the Plan, and in the past year the Division's field organization has been strengthened with broad authority to correct hazards that endanger lives. In addition, field engineers function under five regional managers and more than 20 district managers who oversee job safety and health in specific territories. We believe this decentralization also speeds up correction of workplace hazards. We have already expanded the DIS staff of field engineers, and expect to hire additional Engineers when the Plan goes into effect. At that time the DIS staff of field engineers should grow to at least 250.

The budget for DIS and related programs proposed for 1973-74 is about \$6.2 million, and this figure may rise up to 30 percent as the California Plan is implemented. Funding can be granted by the Federal Government, and the total program in its first year may eventually cost up to \$12 million, with half paid by the State.

Approval of the State Plan, of course, is the first step toward a changeover to OSHA in California. But even with approval, the Plan cannot become fully operative until the Legislature acts on statutory changes called for by the Plan—for example, establishment of the Standards Board and the Appeals Board require legal authority. Under the Plan, California will be allowed three years within which to make the necessary legal and administrative changes.

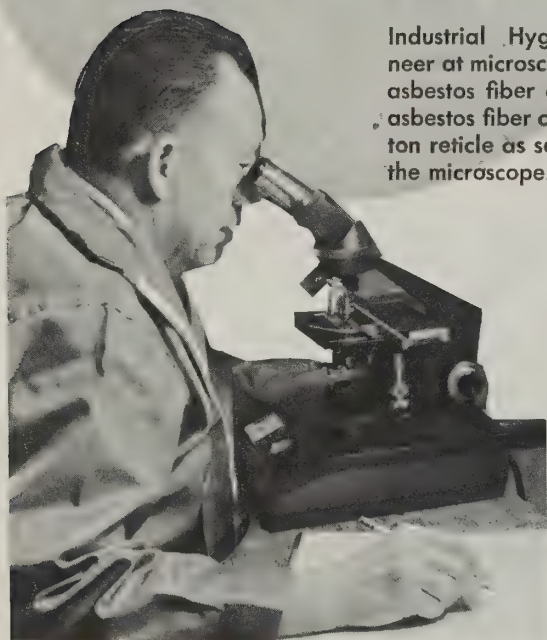
California now has good accident prevention and industrial safety programs; under OSHA, they must be no less than excellent.

To accomplish that, we need the understanding and cooperation of millions of people in management and labor. Full support of our efforts under the California Plan can move us closer to the basic goal we all are working for—to make places of employment as safe and healthful as possible.

OSHA Training for Safety Engineers

Four safety engineers of the State Division of Industrial Safety have received several weeks of OSHA training in Chicago in anticipation of California's obtaining a contract with the federal government. The purpose of the Federal Occupational Safety & Health Act is to assure safe and healthful working conditions for men and women. This is achieved by enforcing standards developed under the Federal Act. The Division is proceeding with plans to enforce its safety regulations with the same force and effect as the federal government.

Sewell A. Knapp, Supervising Engineer of the Research and Education Section holds a key leadership position in the training of the engineers of the Division. With Mr. Knapp at the Chicago OSHA Training Center were Emlyn Cox and David Schumaker, both of whom had previously received OSHA training and were members of the very successful Target Industries Program conducted jointly by the State of California and the federal government. Clifford Erickson, Safety Engineer in the Pressure Vessel Unit of the Oakland office of the Division, had received his training in Chicago in March. These engineers, with the assistance of other engineers, are conducting the training of all engineers of the Division. Groups of 25 men are receiving training in their area during a one-week period, and prior to July 1, training of all engineers will be completed.



Industrial Hygiene Engineer at microscope making asbestos fiber count. Note asbestos fiber crossing Porton reticle as seen through the microscope.

On January 22 and 23 the Industrial Safety Board held a public hearing on the asbestos safety standards. Some changes were made to bring them into closer conformance to the OSHA regulations.

Because of the new findings on asbestos toxicity and the number of employees exposed to excessive levels of asbestos fibres in the air the Safety Board wanted the standards adopted at the earliest feasible time, while yet allowing time to comment on the changes if necessary. The emergency adoption permitted both options. Within the next 120 days another hearing will be held by the Board to invite additional comments.

These Orders are effective as of March 30, 1973.

Article 110. Special Hazardous Substances and Processes

5208. Asbestos. (a) The 8-hour time-weighted average concentration of airborne asbestos fibers to which any employee may be exposed shall not exceed 5 fibers,* longer than 5 micrometers, per cubic centimeter of air as determined by the membrane filter method using phase contrast illumination and 400 to 450 \times magnification. The ceiling or short time concentration to which employees are exposed shall not exceed 10 fibers per cubic centimeter.

* The 8-hour time-weighted average concentration of airborne asbestos fibers is scheduled to be reduced to 2 fibers per cubic centimeter on July 1, 1976.

(b) Engineering controls, such as but not limited to, isolation, enclosure, exhaust ventilation, and dust collection shall be used to meet the exposure limits in Section 5208 (a). All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of such limit shall be provided with local exhaust ventilation systems. The American National Standards Institute Z9.2-1971 Standard Governing the Design and Operation of Local Exhaust Systems shall be used as a guide to design, construct, install, and maintain such systems.

(c) Asbestos shall be mixed, handled, applied, removed, cut, or otherwise worked wet insofar as practicable. Asbestos spills shall be cleaned up promptly. Asbestos-containing cement, mortar, coating, grout, plaster, or similar material shall not be removed from bags, cartons, or other containers without being wetted, unless it is enclosed and/or ventilated to effectively control airborne fibers as specified in Section 5208 (a).

(d) Respiratory Protective Equipment. When engineering controls and wet handling methods are not feasible or are incapable of controlling the concentration or in an emergency, respiratory protection shall be provided and worn in accordance with provisions of Section 5144 and the following requirements:

(1) Reusable or single-use air filtering respirators shall be used when the concentration exceeds the levels specified in Section 5208 (a), but may not be used when the concentration may reasonably be expected to exceed 10 times the limit.

(2) Powered air filtering respirators may be worn for lower concentrations, but shall be worn when the asbestos fiber concentration is reasonably expected to exceed 10 times, but not 100 times the limit in Section 5208 (a).

(3) Continuous flow or pressure demand air line respirators or self-contained breathing apparatus may be worn for lower concentrations, but shall be worn when the asbestos fiber concentration is reasonably expected to exceed 100 times the limit in Section 5208 (a).

(4) No employee shall be assigned to tasks requiring the use of respirators if based on his recent examination an examining physician determines that the employee will be unable to function normally wearing a respirator or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to an equivalent job whose duties he is able to perform, if such a position is available.

(e) Change Rooms and Special Clothing.

(1) The employer shall provide and require the use of special clothing such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in Section 5208 (a).

(2) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in Section 5208 (a), the employer shall provide change rooms for employees working regularly at the place.

(3) The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employees street clothes from his work clothes.

(f) Laundering.

(1) Laundering of asbestos-contaminated clothing shall

ADOPTS ASBESTOS REGULATIONS

be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in Section 5208 (a).

(2) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in Section 5208 (f)(1) to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in Section 5208 (a).

(3) Contaminated clothing shall be transported in sealed impermeable bags or other closed, impermeable containers, and labeled in accordance with Section 5208 (h).

(g) **Monitoring and Record Keeping.** The employer shall sample the air within the breathing zone of employees at locations where the airborne asbestos concentrations may reasonably be expected to exceed 1 fiber, longer than 5 micrometers, per cubic centimeter. Where the asbestos fiber concentration exceeds the level permitted in Section 5208 (a), the employer shall undertake a compliance program as specified in paragraphs (b),(c),(d),(e), and (f) of this section, and in addition, a schedule of monitoring shall be established so the time-weighted average concentration can be calculated with reasonable accuracy for each employee based on his working time at each concentration to which he is exposed. Records of these exposure calculations shall be available to the Division and to the employees and former employees or their representatives. The number of sampling locations, the number of samples, and the frequency of sampling may be reduced when sufficient experience has indicated that the concentration can be estimated reliably. However, the sampling frequency may not be reduced to less than once each 6 months where exposure may reasonably be expected to exceed levels specified in Section 5208 (a).

(h) **Caution Signs.**

(1) **Posting.** Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in Section 5208 (a). Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(2) **Sign Specifications.** The warning signs required by subparagraph (h)(1) shall conform to the requirements of format signs specified in Section 6003 (d)(4) of the General Industry Safety Orders and to this subparagraph. The signs shall display the following legend in the lower panel, with the letter sizes and styles of a visibility at least equal to that specified in this subparagraph.

LEGEND	NOTATION
Asbestos	1" Sans Serif, Gothic or Block
Dust Hazard	¾" Sans Serif, Gothic or Block
Avoid Breathing Dust	¼" Gothic
Wear Assigned Protective Equipment	¼" Gothic
Do Not Remain in Area Unless Your Work Requires It	¼" Gothic
Breathing Asbestos Dust May Be Hazardous to Your Health	14 Point Gothic

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(i) **Caution Labels.**

(1) **Labeling.** Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in Section 5208 (a) will be released. For large outdoor storage such as mine ore tailings piles, labeling shall not be required if properly posted.

(2) **Label Specifications.** The caution labels required by subdivision (a) of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

BREATHING ASBESTOS DUST MAY

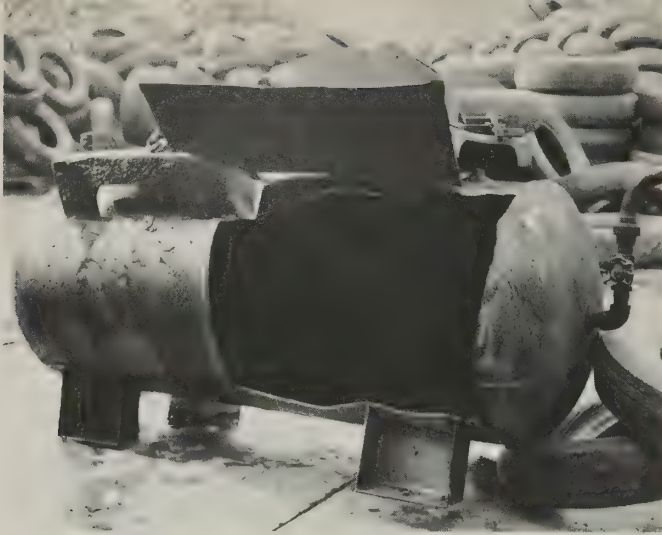
CAUSE SERIOUS BODILY HARM

(j) **Medical Examination.**

(1) The employer shall provide or make available at his cost a comprehensive preplacement examination of each employee working regularly with asbestos who has been or may be reasonably expected to be exposed to concentrations of asbestos fibers in excess of 1 fiber, longer than 5 micrometers, per cubic centimeter. Such examination shall be given within 90 days of the effective date of this regulation for existing employees who have not had an examination within 1 year and within 90 days following his first employment for new employees. Such examination shall include as a minimum a 14-inch by 17-inch chest X-ray (posterior and anterior), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at one second (FEV_{1.0}).

(2) At least annually every employer shall provide or make available at his cost a medical examination as specified in Section 5208 (j)(1).

(3) Records shall be kept of medical examinations required in Section 5208 (j)(2) for each employee; such records shall be maintained by the employer for at least 30 years. Access to records of medical examinations required in Section 5208 (j)(2) shall be made available for inspection and copying to the Division of Industrial Safety, the Department of Health, to authorized physicians or medical consultants of either of them, and upon request of an employee or former employee to his physician. Any physician who conducts a medical examination required by this section shall furnish the employer of the examined employee all the information specifically required in Section 5208 (j) and any other medical information related to occupational exposure to asbestos.



PRESSURE VESSEL

James Glen, Senior Safety Engineer
Pressure Vessel Unit, Division of Industrial Safety

No accurate figures are available, but records indicate that in the 40 years from 1870 to 1910, there were 10,000 boiler explosions in the U. S. and adjacent parts of Canada and Mexico—more than one recorded explosion every 36 hours. By 1910, with the use of boilers steadily increasing, the rate had jumped to between 1300 and 1400 per year.

It was not the steady procession of disaster, however, but the occasional spectacular explosion that created the headlines and caused the greatest furor. On October 8, 1894, there was an enormous boiler explosion at the Henry Clay coke mine in Shamokin, Pennsylvania, when 27 boilers exploded "like a bunch of firecrackers going off." It was remarkable that not more than six people were killed and three injured.

More tragic was the fate of the Mississippi River steamboat SULTANA, which figured in what was the most destructive boiler explosion of all time, in terms of human life. On April 27, 1865, the SULTANA was on her way from New Orleans to St. Louis. Below decks were some 2200 Union soldiers, recently released from the military prison at Andersonville, Georgia. They were to be sent to Cairo, Illinois.

The men, weak and emaciated from their confinement, were crowded onto cots placed in cabins directly above the ship's boilers. Shortly after the vessel left Memphis the boilers exploded, ripping the floor under the prisoners' cots. One eyewitness said that the boat looked like a huge bonfire in the middle of the river.

Reports differ as to the number of men lost in the SULTANA'S explosion and fire, ranging from 1200 to 1450. It is certain that more than half of the 2200 men had survived the rigors of imprisonment only to go to their deaths before they could be reunited with their families. It was a sad day in the history of American marine transportation.

At that time, river travel had become such a hazardous undertaking, in fact, that one traveler from abroad was told that his best hope for safety lay in getting a berth as far aft as possible. He quoted a sign over the mirror in his cabin: "Passengers will find life-belts under their berths. The doors can also be lifted easily off their hinges, and the mattresses make good life-preservers."

Early attempts to keep down the number of boiler explosions were disorganized and generally ineffective. President Van Buren appointed a three-man commission in 1838 to look into the problem. The first effective measures for control, however, did not come until after the beginning of the twentieth century. One of the inci-

dents that started the movement was an explosion in the R. B. Grover Shoe Co., shoe factory at Brockton, Massachusetts, in 1905. The blast killed 58 people and injured 117. The company suffered property loss amounting to \$250,000, and claims against it came to another \$280,000.

In 1911 the American Society of Mechanical Engineers became involved by forming a Boiler Code Committee. In 1914 the first code for the construction of boilers was published.

Gradually through the years, the code has been expanded and up-dated so that in 1972 the overall accident/injury statistics point to tremendous progress by the pressure vessel industry.

There are over 14,000 high pressure boilers in this State and uncounted numbers of low pressure boilers, plus pressure vessels that include 150,000 air tanks, 18,000 LP-Gas tanks (which both require periodical inspection) and tens of thousands of miscellaneous unfired pressure vessels.

The year 1972 brought us a total of 55 reported accidents with boilers and pressure vessels. Out of this total, there were 3 fatalities and 55 lesser injuries. Two of the fatalities were with the failure of a 4-inch grey cast iron steam separator and the third was with a retort and its quick opening end closure.

High and Low Pressure Boilers

There were 18 accidents with 8 injuries in 1972. All the injuries were burns—first, second and third degree and were caused by furnace explosions.

One overpressure explosion involved a high pressure Scotch dry back boiler. The furnace ruptured due to low water and blew out both ends of the boiler. The boiler moved three feet from its original setting and extensive damage was done to the boiler room.

Another furnace explosion caused a cast iron hot water heating boiler to move about 15 feet from its setting, going through the boiler room door and ending up outside the building. The rear wall of the boiler room had a large hole blown through it and fixtures in an adjacent room were demolished. The gas accumulation in this boiler had been ignited by a fired water heater in the same room.

A furnace explosion occurred when a stationary engineer was attempting to light the extinguished pilots in a Birchfield low pressure steam boiler. This boiler and an adjacent hot water heating boiler were horizontally vented to a common stack. Due to temperature inversion conditions and a relatively cool stack, vent gases from the hot water heating boiler entered the furnace of the steam boiler and extinguished the standing pilots, allowing gas to accumulate in the fire box.

It was reported to the Division that five large oil field recovery heaters burned up during the recent cold spell. These units failed because of freeze-ups in the instrumentation piping. One of these heaters burned up to the point that molten tubes in the radiant section flowed out of the furnace.

An old locomotive firebox boiler that had been rebricked and operated only on low fire conditions since the rebricking, was involved in a furnace explosion. The boiler operator was checking the boiler and noticed low steam pressure on the gauge. At this time a flashback

ACCIDENTS...

A Look at 1972

occurred that blew the firebox door open and burned the operator around the face. Fortunately this person was wearing safety glasses and a hard hat or he might have sustained more severe injuries. This boiler, because of cold weather at the time, had been increased to a high firing rate on the morning of the accident. The air intake to the boiler had been restricted during the re-bricking and while satisfactory for a low fire, was insufficient for high firing and a momentary flame-out occurred. Reignition was apparently from hot brickwork or the standing pilot and the firebox explosion occurred.

L.P. Gas

In a total of 17 accidents reported, involving Liquefied Petroleum gas, 22 injuries were sustained. All the injuries were burns.

Two of the accidents were attributed to overfilling of the tanks.

The safety valve on a mobile fuel tank on a bus opened and discharged on some passengers, burning 5 of them.

The other overfilled tank was used in a roofer's operation and mounted on a flat-bed truck. The discharge from the safety valve ignited and engulfed the truck in flames, also partially destroying a wood frame building under construction.

Failure to detect leaking L.P. Gas from the P.O.L. valve on a mobile fuel tank mounted on a truck caused injury to 6 people. The truck had been parked in the garage of a residence and approximately 3 hours later a sheet of flame engulfed the kitchen and living room. Ignition was probably from the kitchen range.

A "do it yourself" plumber crawled under his home to make a repair to one of the drain pipe connections. He had attempted this repair with a small blow torch, but this proved ineffective. He then went to a rental yard and acquired a refillable 2½ lb. L.P.G. cylinder equipped with a shut off valve at the tank, a 10% valve, a safety relief valve, a pilot control needle valve, with the master control valve operated by a lever which would be depressed by the user, while holding the handle on the cylinder. This unit operated satisfactorily at the rental yard, but at the man's home an attempt to use it under the house caused an accident. The pilot valve was opened and the burner lit; at this point a blast of L.P.G. came out from the back of the control valve and flame shot out of the burner nozzle. The user was very fortunate that he only received second degree burns. This, due to the confined area, could have been a fatality.

A lady had a 5-gallon LP-Gas cylinder filled and placed in the trunk of her car. On the way home, she stopped at a traffic light. She lit a cigarette and there was an explosion. The cylinder was supposedly not overfilled, but while bouncing around in the trunk of her car, the P.O.L. service valve opened slightly, allowing gas to escape. Cylinders should always be properly secured in transit.

An accident occurred when a farmer decided to use L.P.G. to blow out dust from the filters of a combine harvester. The machine was shut down, but apparently there was still a source of ignition and when the L.P.G.



was turned on, a fire ensued. The user was burned about the face and hands.

An employer furnished an employee with a small dwelling to live in. Shortly after moving in, the employee attempted to light the oven in the stove, and when so doing, there was an explosion and fire which effectively destroyed the dwelling. It seems that the previous occupant had disconnected a small heater, leaving the gas line open, and allowing propane vapor to enter the house. The employee suffered first, second, and third degree burns to his body.

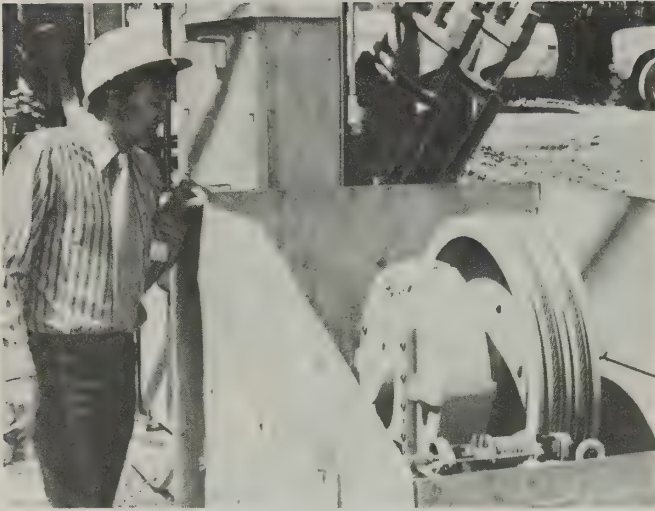
The last reported accident with L.P.G. caused injury to 6 persons. It involved a tank of approximately 110-gallon capacity. The tank was to be returned to the L.P.G. dealer, but before doing this, the user wanted to remove all gas. The user operates a business where the trucks are fueled by L.P.G. It was decided by the president of the company to elevate this 110-gallon tank to about 5' or 6' above ground level, and then by gravity, fill one of the fuel tanks on a truck. It was the intent to lift the tank with a fork lift and then transfer it over to a stack of pallets before starting the gravity fill. The tank apparently fell from the fork lift and upon landing on the ground the relief valve connection cracked. This accident occurred in the yard of the company. When the tank fell and the relief valve connection cracked, the escaping propane started entering the main building through the shop doors. At this time an explosion and fire occurred and immediately traveled back to the source. The truck to be fueled was destroyed and the main building was badly damaged. The other 5 people who were injured during the explosion and fire received second degree burns and cuts from flying glass. There was no cover to protect the tank fittings and the safety valve had been installed in a street ell instead of in the tank as required by the Liquefied Petroleum Gas Safety Orders.

Liquefied Natural Gas

There was one accident in this category. A mechanic was testing for leaks, in L.N.G. piping, in a car trunk, with soap suds. The leak was detected and repaired. A battery was then placed in the trunk in order to test a

Continued on page 14

SUTRO

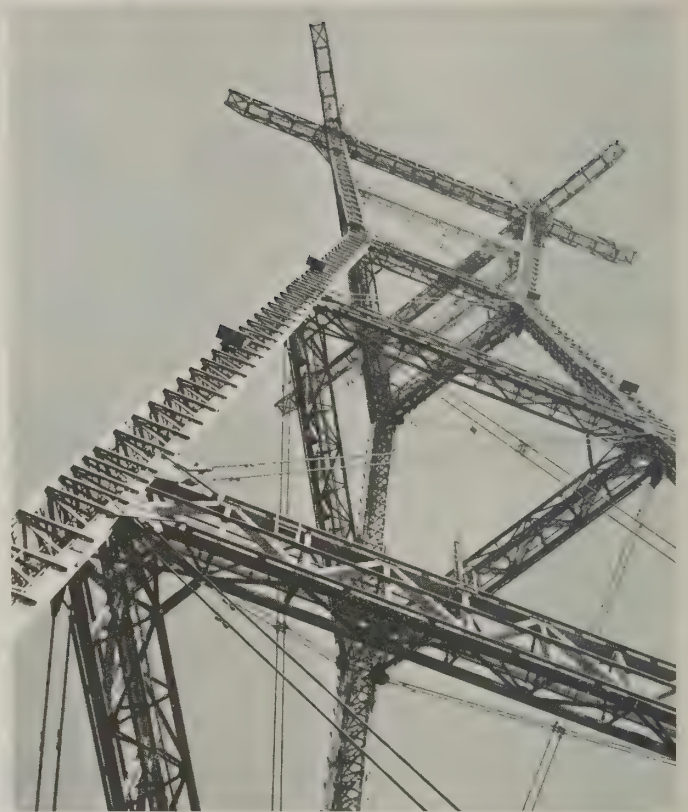


Traction sheave and machine in watertight case

Not only will San Francisco residents be able to enjoy better television reception, but the construction of the Sutro T.V. Tower on Sutro Mountain was an extraordinary challenge to the engineers, architects, construction workers, and Division safety engineers in the matter of designing a safe structure and erecting it safely—all 750 feet of assembled steel with 200 feet of antennas extending the total height to 950 feet.

These antennas will need periodic maintenance and inspection, but how does one get to the top? Vertical steel ladders have been installed in the legs—but how would you like to climb 750 feet up a ladder? Kline Iron and Steel, Inc. of South Carolina came to the rescue and installed an elevator in the West leg. It is a small unit that travels 742 feet at 100 feet per minute. The cab is 2 feet 5 inches by two feet nine inches in floor area and has a 750 pound capacity.

Tension weights with guards removed



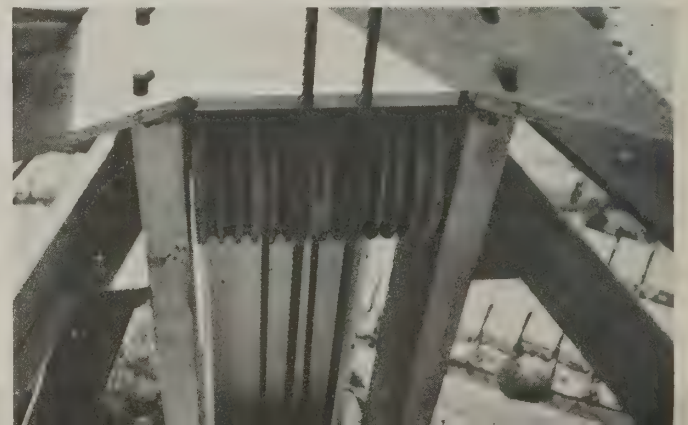
View of tower leg showing degree of angle on turn

Since the tower is of an unusual structure, it was impossible to install the elevator to conform with the California Elevator Safety Orders. Through combining the engineering abilities of private enterprise and the Division engineers, a safer form of transportation was created and justified variations were granted.

PROBLEMS OVERCOME

The first problem encountered was to design the car to travel within one of the tower legs which is out of plumb and also makes a turn. (This may be noticed on the above picture.) The car's traveling out of plumb was not a big problem, but the turn was challenging.

The car structure was designed with two pivot points. The top pivot point was placed just below the top guide shoes—the bottom pivot point right above the bottom guide shoes. To prevent the hoisting cables from rubbing and cutting into the tower at the turn, a roller system was employed to minimize friction (as shown below).



TOWER ELEVATOR

Ron Craven, Safety Engineer
for Unit, Division of Industrial Safety

Since the hoistway is not enclosed, the elevator is left exposed to the weather. There was no problem in weather-proofing the unit, but conditions caused by the wind could be very troublesome if conventional construction were used. Therefore, the governor rope, compensating ropes, traveling cables (electric wire cables to the car) which could be frequently damaged by the wind, were eliminated. No electrical power is supplied to the car. A battery-powered radio transmitter has been installed in the car. A receiver on the ground unscrambles the signals and feeds them to a controller.

The possibility that the elevator might be controlled by outside radio waves, such as passing airplanes, ham operators and the transmission from the tower itself was given a great deal of thought. An antenna cable is securely fastened in place, running the full length of the tower and connected to the ground unit. The car unit signals are transmitted through loop antennas on the car to the hoistway antenna cable by induction. A phone (with transmitter) operates in a similar manner and provides for two-way conversation to the ground.

The governor rope was eliminated by mounting the governor in the car under-carriage. To prevent the need of compensating ropes and the trouble of hinging the counterweight frame to make the turn in the hoistway (as was the car) the counterweights were eliminated (see roping diagram and caption).

CAR SAFETY DEVICES

The car is equipped with two separate sets of safeties. Mounted in the crosshead (top section of car frame) is a broken-rope type safety. This safety is actuated by the breaking or slacking of the hoisting cables. There is also a handle inside the car which, if pulled down, will set these safeties. The other safety is of the overspeed governor-actuated type. It is operated by the car overspeeding. This safety is mounted in the car safety plank (bottom section of car frame). The governor is driven by two guide rail rollers per side (each end of the safety plank). Each "set" of drive rollers has one roller in tension against the guide rail. The tension is adjustable with a maximum of 1000 pounds pressure.

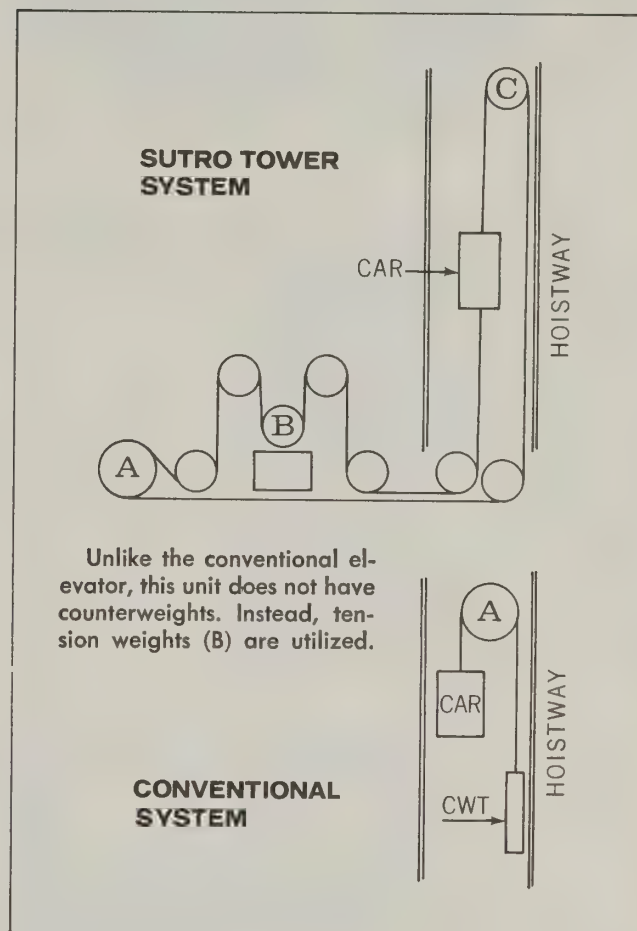
When either of the safeties are tripped, hinged "dogs" are swung out and make contact with the guide rails. They create a wedge-like bind between the car and the guide rails. The more weight on the "dogs" the tighter the wedge. Thus the car would be totally suspended by the guide rails.

The guide rails of conventional elevators are a straight length of steel in the shape of a "T" with a machined facing. They are rigid with little give. This type of guide rail would not have enough flexibility to match the flexibility of the tower structure.

The guide rail system installed in the tower leg is 1½ inch extra heavy galvanized pipe. The lengths of pipe are fastened together by a sleeve inside the splice. There is a spacing of ¼-inch between the ends of the pipe lengths for expansion.

The end result appears to be a satisfactory compromise between the ingenuity of private enterprise and the flexibility and cooperation of the Division. Safety was always in mind and was never compromised.

ELEVATOR ROPING DIAGRAM



The diagram illustrates the unusual roping method. There are two cables (¾-inch diameter) side by side. One end of each cable is shackled (attached) to the top of the elevator car. They travel up and over the overhead sheave (C), then down to an idler sheave in the pit, to the traction sheave (A), around two more idler sheaves and then to the tension weight sheave (B). The tension weights are mounted within a guided slot. The weights are suspended from the cables and are free to travel a limited vertical distance. The ropes then continue around two more idler sheaves and are shackled to the bottom of the car. The traction sheave (A) is part of the driving machine and is "V" grooved to provide traction of the cables. This is the power source to start and stop the car.

In comparison, one of several conventional systems would have the traction sheave at the top of the hoistway. The cables would be attached to the top of the car at one end then run up and over the traction sheave, then down and attached to the counterweights. In essence, the sheave would pull the car up to raise the car and pull the counterweights up to lower the car. The Sutro Tower system pulls the car in both directions of travel.



Underground tunnel excavation performed by a highly automated mechanical mole.



Modern surface mine haulage at Eagle Mountain mine, Riverside County.

Mining and Tunnel Safety in California

Larry McCune, Senior Engineer

Construction/Industrial Unit

Division of Industrial Safety

Safety in mines and tunnel construction has always been of great interest. Recent disasters such as the Sunshine Mine fire and tunnel explosions have been in the news. Even though progress has been made in reducing injury rates, mines and tunnels remain more hazardous than the industry average. Men working underground must always be prepared to escape or be rescued in case of a fire or other emergency. This problem is not so difficult in other places of employment.

One recent development in mine safety was the signing of a State Plan contract with the U.S. Bureau of Mines to perform the inspection and enforcement work under the "Federal Metal and Non-metallic Mine Safety Act." This contract requires the inspection of about 750 mines and mills as well as other accident prevention work. The effectiveness of the State is monitored by the Bureau of Mines under this program.

In order to concentrate more accident prevention work in mines and tunnels, Assembly Bill 1157, the Tom Carrell Memorial Tunnel and Mine Safety Act of 1972, was enacted. The Act applies to tunnel construction, underground mines, and surface mines including sand and gravel operations. The Division of Industrial Safety is required to set up a separate unit of specially trained safety engineers to inspect all tunnel construction and mine operations. Sufficient manpower shall be maintained to provide four annual inspections of underground mines, one inspection of surface mines annually, and six inspections of tunnels under construction annually. Present plans call for implementing the Tunnel and Mine Act with ten Mine and Tunnel Safety Engineers, two Senior Mine and Tunnel Safety Engineers, and a staff unit.

Realizing that inspection is not the complete answer to safety, the Act has provisions for the Division to be notified before initial mining operation or construction may be started at any mines or tunnels. A pre-job safety conference will also be held with the Division for all underground operations. This feature will permit the review of plans, formulation of a safety program, development of emergency plans, and review of job hazards with those concerned.

Underground operations will also require a classification based on the potential of encountering flammable gas or petroleum vapors. The basic classifications will be non-gassy, potentially gassy, gassy, or extrahazardous. This will depend on rock formations involved, if gas has been encountered, or other data submitted to the Divi-

sion. The Act also requires posting of the classification notice and any special rules applying to the operation of an underground mine or tunnel.

The employer at each underground mine and tunnel must develop an emergency rescue plan. The plan and underground map shall be provided to the local fire and rescue units, to the Division, and to every employee at the place of employment. Trained rescue crews are required for tunnels with more than 10 men, or mines with more than 25 men underground at one time. Smaller mines are required to have one man for each 10 men underground who receives annual training in the use of breathing apparatus. Another important provision is the refuge chamber or alternate escape route within 5,000 feet of the face of gassy or extrahazardous tunnels. This allows persons wearing self-rescuers to reach a place of safety in an emergency.

Strict operating rules are specified by the Act for the operation of gassy or extrahazardous underground operations. If the level of gas in any tunnel or underground mine reaches 20 percent of the lower explosive limit, the men shall be removed until the Division has authorized re-entry. The operating rules will be incorporated in the Tunnel and the Mine Safety Orders. The licensing of blasters and the certification of gas testers and safety representatives is also required for underground mines and tunnels. The Division is developing the minimum qualifications and examinations to be given for the licensing programs.

The overall effect of a full coverage mine and tunnel safety program will involve the Division in the planning stage of tunnel projects and mining facilities. The Division's safety engineers will also be involved in safety programs and other accident prevention activities. This safety effort should reduce the injury rate and reduce the disaster potential in California's mines and tunnels.

The trend in mining and tunneling is towards larger, more automated equipment. Many hazardous conditions and work practices have been identified and corrected. If progress is to be made in reducing injuries, we must protect ourselves from the machines we have already built and design safety into future operations. The environmental hazards of noise, dust, extreme temperature, and toxic materials remain to be solved. The objective of safe mines and tunnels can only be achieved in a cooperative program with management, labor, and government all participating.

CONFIGURATION STANDARDS ADOPTED

**E. E. Carlton, Supervising Safety Engineer
Electrical Unit, Division of Industrial Safety**

The California Industrial Safety Board adopted revisions to the Construction Safety Orders for attachment plugs and receptacles at its January 22, 1973, meeting. These revisions included adoption of the new American National Standards Institute (ANSI) standards which provide that each configuration shall have only one ampere and one voltage rating. These new ANSI standard configurations have ratings up through 60 amperes in the non-locking type and up through 30 amperes in the locking type for low voltages commonly used in industry. Each of the old style configurations being replaced had more than one ampere and voltage rating.

As reported in the November 1972 issue of the "California Safety News," this matter has been the subject of considerable controversy in the construction industry.

Provisions of the revised Construction Safety Order 1763(a) require that (1) receptacles connected to circuits having different voltages, frequencies, or types of current (a.c. or d.c.) shall be of such design that attachment plugs used on such circuits are not interchangeable, and (2) receptacles shall be installed only on circuits of the voltage class and current for which they have been approved. The Safety Order further provides that 50-ampere locking type plugs and receptacles shall be of such design or so constructed that the receptacle will not accept plugs of different amperages.

In 1965 the electrical manufacturers withdrew listing with Underwriters' Laboratories on devices of the old configurations due to their interchangeability, but they continued to make and sell these old style devices in spite of the real safety hazard. Devices of the old configurations are not presently listed by any recognized laboratory as having been tested for safety.

The Industrial Safety Board studied 1971 injury statistics furnished by the Division of Industrial Safety in arriving at its decision. These statistics involved workmen injured while using portable electrically operated hand tools, attachment plugs, cords, and receptacles.

Portable electrically operated hand tools accounted for 179 injuries to California workers in 1971. In addition, 81 more workers were injured using cords, plugs, and receptacles. About 70 percent of the injuries involving portable tools occurred when the frame or case of the tool became energized.

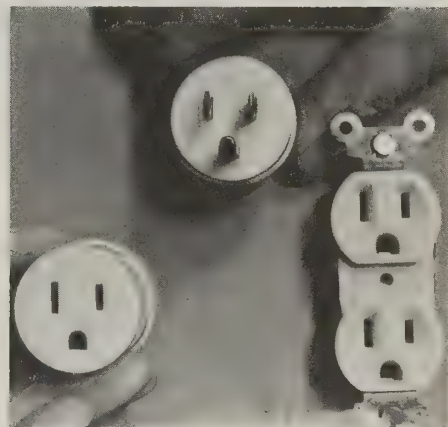
Investigation of these injuries pointed up the problems of misuse, misapplication, and in some cases, apparently the lack of effective enforcement of safe practices by management.

All of these injuries involved the old styles of attachment plugs and receptacles.

The Industrial Safety Board stipulated that a delay of six months' additional time be allowed after the date the revised Construction Safety Orders become effective. This is to permit the construction industry the necessary time to complete the change to the new ANSI devices.



Left: 15a, 125v non-locking. Right: locking type 3 wire (with equipment ground)



15a 125 v non-locking type 3 wire (with equipment ground)



Top: 15a 125v locking type 3 wire (with equipment ground). Bottom: 20a 125v locking type 3 wire (with equipment ground)

50a 125/250v locking type 4 wire (with equipment ground)





PUBLICATIONS AVAILABLE

The following bulletins and placards are available without cost by writing to the Division of Industrial Safety, Education Unit, 455 Golden Gate Avenue San Francisco, Ca. 94102 or 3460 Wilshire Boulevard Los Angeles, Ca. 90010 or other Division offices.

BULLETINS

S-103 "Safe Handling of LP Gas" gives the use and characteristics of LP gas and rules for safe handling.

S-108 "Taming the Circular Saw" deals with a useful but dangerous tool.

S-109 "Safety Films Available from the State Division of Industrial Safety."

S-110 "Tips for Hotel Workers" is a guide to safety in hotel work.

S-111 "Farm Safety Check List" is a safety guide for everyone on the farm.

S-117 "Stop Grinding Out Injuries!" describes abrasive wheel precautions.

S-120 "Safety Rules for Painters" shows how to prevent injuries to painters.

S-122 "Handy Rules for Hand Tools" describes the proper care and use of many common tools.

S-123 "Three Steps for the Safe Use of Portable Ladders" explains how to avoid ladder accidents.

S-124 "Safety Rules for Roofers" alerts to dangers and gives precautions against slips and falls, tar burns, strains and ladder injuries.

S-125 "Are You Using Carbon Tet?" deals with a hazardous chemical.

S-127 "Look Out for Yourself When Around Crop Spraying" is directed to farmworkers. (Also available in Spanish.)

S-128 "If You Work in a Quarry" covers quarry and open-pit mine workers.

S-135 "Check List of Requirements" is a guide for employers, safety engineers, and purchasing agents on what to check before buying or renting equipment or placing contracts.

S-137 "Skin Trouble Is Plenty Trouble" deals with the most common disease you can get at work.

S-141 "Power Hand Saw Safety" gives causes of power hand saw injuries.

S-142 "Live With the Label" cautions users of hazardous substances.

S-143 "Trade Association Safety Programs" reveals their value.

S-145 "Safety Publications Available from the State Division of Industrial Safety."

S-146 "Safety in Pipeline Construction" tells how to plan and organize pipeline jobs and how to insure safety in various phases of the job.

S-148 "The Safe Use of Aqua Ammonia in Agriculture" describes necessary precautions for safe use of aqua ammonia.

S-150 "Electrical Safety and Swimming Pools" describes precautions to take to make swimming pools safe electrically.

S-153 "Electrical Safety on the Farm" tells how to guard against electrical hazards.

S-154 "The Tailgate Safety Meeting" gives pointers on effective means to promote on-the-job safety.

S-157 "Guard Standards No. 2—Stairways and Railings" gives requirements for stairways, railings, entrances to stairways, and floor and wall openings.

S-158 "Protection of Workmen in Trenches" describes the measures that will reduce the heavy death toll in excavation work.

S-160 "Confined Space Can Be a Death Trap!" Describes hazards of work areas where poisonous gases can build up or oxygen be lacking—sew-

ers, tank cars, vats, shafts, barges, silos, etc.—and what to do about this danger.

S-415 "Your Life May Depend on a Safe Scaffold" gives requirements for a safe scaffold.

S-657 "Accident Prevention Program for the Construction Industry" contains requirements every construction employer must observe.

S-802 "Lock Out Block Out" tells how to safely lock out or block out machinery or equipment.

S-803 "Standard Whistle Signals for High Lead Logging" gives complete set of signals.

S-804 "Fork Lift Truck Operation" safety and common sense in material handling by fork lifts. States rules and gives accident prevention tips.

S-806 "Hand Lifting" safety and common sense in material handling through correct lifting techniques.

PLACARDS

S-101 "Safe Handling of LP Gas" gives safe procedures for handling and installing LP gas units. (5½" x 8½")

S-611 "Construction Hoisting Signals" gives bell or whistle signals required by the Construction Safety Order 1612(c). (5½" x 7")

S-612 "Notice! Fuse Used Here Burns at the Rate of One Foot in — Seconds." (8½" x 11")

S-615 "Stop Machinery Before Oil-ing, Cleaning, Repairing." (8½" x 11")

S-617 "Wear Goggles. You Can Get Used to Goggles—But Never to a Glass Eye." (8½" x 11")

S-627 "Caution! Don't Go Between Brow Log and Load. Don't Dump Logs Until All Men Are Clear." For use at log dumps and ponds. (8½" x 11")

S-800 "Hand Signals for Boom Equipment Operation" shows approved arm and hand signals in diagrams. (8½" x 11")

S-801 "The ABCs of Safety" is an amusing alphabet in which every letter relates to safety. (8½" x 11")

Safety Orders Available

While the Division of Industrial Safety distributes many free brochures and other safety information the Safety Orders are available only in Sacramento and there is a small charge made to cover printing costs.

Safety Orders of the State of California are available from Office of Procurement, Document Section, P. O. Box 20191, Sacramento, California 95820.

All sales are subject to payment in advance. Money orders or checks should be made out to State of California. Add 5 percent sales tax for California addresses. There is a 10 percent discount on orders of fifty (50) or more of same title. Minimum sale is .50¢ and stamps are not acceptable.

Price List

CALIFORNIA SAFETY ORDERS	WITH SALES TAX	
Aerial Passenger Tramway Safety Orders	\$0.75	\$0.79
Boiler and Fired Pressure Vessel Safety Orders .....	.75	.79
California Shaft Bell Signals (on oil cloth)	1.50	1.58
Compressed Air Safety Orders .....	.75	.79
Construction Safety Orders	2.00	2.10
Electrical Regulations (See Title 24, Part 3, below) *		
Elevator Safety Orders	2.00	2.10
General Industry Safety Orders	2.00	2.10
Logging and Sawmill Safety Orders	2.00	2.10
Mine Safety Orders	1.00	1.05
Petroleum Safety Orders, Drilling and Production	1.50	1.58
Petroleum Safety Orders, Refining, Transportation and Handling	1.50	1.58
Ship and Boat Building Safety Orders .....	.75	.79
*Title 24, Part 3 (Basic Electrical Regulations)	7.00	7.35
Tunnel Safety Orders	1.00	1.05
Unfired Pressure Vessel Safety Orders	1.25	1.31
Window Cleaning Safety Orders	1.00	1.05
INSPECTION REPORT FORMS (price listed is per pad of 50 forms)		
No. S-152—Elevator Inspection Report .....	.57	.60
No. S-217—Elevator Reinspection Report .....	.35	.37
No. S-600—Boiler Report .....	.62	.65
No. S-601—Unfired Pressure Vessel Report .....	.40	.42
No. S-602—Liquefied Petroleum Gas Installation Report .....	.40	.42

Two Awards for Crown Zellerbach Corp.

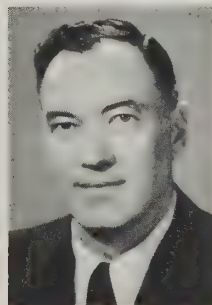


Howard Pyle, President, NSC (right) presents a charter member award to Miles Murray, Manager of Safety Services of Crown Zellerbach Corporation at the 60th Annual Meeting of Members.

Crown Zellerbach Corporation was honored as one of the 68 Charter Year member organizations of the National Safety Council which they helped found 60 years ago. On the same day, October 30, 1972, the San Francisco based corporation was awarded the Arthur Hoyt Scott Award for outstanding safety achievement in the pulp and paper industry at the National Safety Council's Congress in Chicago.

A total of 23 companies competed for this award which is presented annually to the multiplant company whose operations in all of its eligible plants combine for the best safety achievement in the pulp and paper industry. Among the factors considered is the average accident frequency rate over the past 5 years and the degree of frequency rate reduction during the same period. Crown Zellerbach had a frequency rate (the number of disabling injuries per million man-hours) of 3.32 for 33.4 million man-hours in 50 plants during 1971.

New Regional Manager



Mr. George E. Harris was appointed Regional Manager for the North Central Region, replacing Paul Boettcher. He and his staff of 46 job safety experts will serve the counties of Shasta, Modoc, Lassen, Siskiyou, Tehama, Glenn, Butte, Plumas, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Yolo, Solano, Sacramento, San Joaquin, Contra Costa, and Alameda. Headquarters are in Sacramento.

Mr. Harris has been with the Division since 1960 where he held the positions of district safety engineer and senior safety engineer.

Commenting on the Division's reorganization which added five regional managers in May 1972, Mr. Wilkins, Division Chief, said, "The changeover to regional offices allows more effectiveness in field operations, permitting us to move quickly to correct work place hazards, and it has also resulted in closer coordination among the various engineer specialists."

solenoid valve in the piping. A spark set off accumulated unoderized gas and burned the mechanic.

Air Tanks

There were two reported accidents this year and both caused injuries. The first involved a portable rotary-type air compressor. The compressor overheated due to lack of cooling water to the oil cooler. This caused the oil in all 3 tanks in the system to overheat. The heat melted the solder joints in the oil lines and caused a flash fire causing an injury to an employee.

A malfunctioning air compressor caused the receiver to overheat and melt a boiler-type fusible plug that had been installed in the shell of the tank. During overheating, air in the receiver became contaminated. A sandblast operator who was using breathing and working air from the tank was found unconscious after the accident.

Miscellaneous Vessels

Eighteen accidents involving miscellaneous pressure vessels were investigated in 1972; these accounted for 3 fatalities and 13 injuries.

The accident that caused the death of two people and injury to a third involved a grey cast iron steam separator in a 4-inch steam line. The yarway trap on the 1-inch drain line from the separator was leaking. The drain valve was closed and repairs were made to the leaking trap. When the drain valve was opened, after the repair, the body of the steam separator cracked. One person was killed at this time and two others were burned, one very seriously. The badly burned man died a few days later. The separator was in a 200 psi, 400° F. steam line going to a turbine-driven fire pump. The rating stamped on the body of the separator was 250 psi.

The accident causing the third fatality involved the quick opening end closure on a retort. The operator had apparently been having trouble closing the door of the retort. On the day of the accident, the operator was warned by another employee that there was an excessive amount of steam blowing out around the door seal. A few minutes later a loud noise was heard in the cooking room as the retort door blew open. The operator was apparently not hit by the door, but was engulfed in the large volume of escaping steam and lost his life.

The operator had been able to pressurize this vessel without the door being completely closed and the locking mechanism totally engaged. This unit was installed in 1968 and would come under the requirements of UG 35 (b), Section VIII, ASME Code, covering quick opening closures. The end closure was not equipped with the required safety devices called for in the Code and the result was death!

An accident involving a resin storage tank would have cost an engineer his eyesight, had he not been wearing safety glasses. The engineer and a helper were checking the vessel for leaks and had applied approximately 40 psi to the tank. Leaking air was heard coming from the top of the tank and the two men climbed up to investigate. The leak was found at a 6 inch circular pyrex sight glass. When the engineer kneeled down to look closer, he saw several fractures in the sight glass. At this time the sight glass blew out. The force of the explosion shattered both lenses of the engineer's safety glasses and caused numerous cuts and lacerations to his face. Small particles of glass were also removed from the eyes with no impairment of vision.

Failure of a 3-inch quick actuating closure on a non-Code grease dispensing tank cost a truck driver his right eye and crushed the right side of his face. This tank had been positioned under a barrel of gear grease with the intention of filling it. The injured party did not determine if the tank was pressurized, and proceeded to release the two cam lever locking devices holding the 3-inch cover in place. The cover flew off, striking the truck driver and causing this great head injury. There was a pressure gage on the tank but it didn't work.

A boiler operator was injured when a blow off tank blew apart. The operator was having trouble closing the boiler blow down valves and this caused pressure to build up in the tank. Both tank heads blew off, breaking the operator's leg and causing him other injuries. The tank was 24 inches in diameter and 4 feet long. The head and shell thickness was $\frac{3}{8}$ inch. There were two openings, one the inlet and the other a drain. Both were 2½-inch pipe size. The tank had no vent and the heads were flat, attached to the shell by corner welds.

While preparing the day's meals, a dietary worker was scalded when trying to open the door of a steam cooker. After following the normal procedure of opening the combination vent and drain valve to relieve any steam pressure and water, an attempt was made to open the door. When he could not open it the worker called for assistance, and two people tried to open the door. At this time the door tilted and scalding water spilled out the bottom causing first and second degree burns to the legs and feet of one employee. It was recommended that the doors to cookers be left open when not in use, and to install pressure gages.

WORK INJURIES PUBLICATIONS

The following publications are available from Division of Labor Statistics and Research, P.O. Box 603, San Francisco 94101

California Work Injuries, 1971..... February 1973
Electrical Injuries in California, 1971 (Issued
jointly with the Division of Industrial
Safety)October 1972

Work Injuries in Roofing and Sheet Metal
WorkJuly 1972

Work Injuries in Mobile Home and Trailer
Coach Manufacturing—California March 1972

Work Fatalities in the Forest Products Industries—
California March 1972

Work Injuries in the Meat Products Industry—
California October 1971

Work Injuries in California Public Schools May 1971

Work Injuries in California Quarterly

Recent reports have featured articles on:

Work Injuries to Plumbers in the Construc-
tion Industry

Work Injuries Involving Forklifts

Work Injuries to Employees of Painting
Contractors

Work Injuries in Tunnel Construction

They Needn't Have Died

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
A powerhouse mechanic was working inside a dust tank. He was killed when overhead iron dust fell and buried him.	Overhead dust not cleared before work was started.	Overhead iron dust.	Check out tank, remove overhead dust, use a life line and standby man.
A truck driver started to open gate, when the rear top gate support roller went off the rail. The gate fell down on him causing fatal injuries.	Failed to check gate support.	Gate roller without bracket to prevent falling.	Install bracket to prevent gate from falling if roller goes off rail.
An apprentice miner was drilling with an air track, when a slab fell from the roof and crushed him.	Working under a slab.	Loose slab in roof.	Provide adequate ground control and never permit work under a loose slab.
A tractor driver was compacting a corn silage pile when the tractor rolled over. He was killed underneath the tractor.	Driving tractor backwards.	No roll-over protection.	Drive tractor forward. Use roll-over protection and seat belt.
An employee was on a platform approximately 7 feet high. He fell and was killed.	Working on an elevated platform without guard rails.	No guard rails on platform.	Never work on elevated platforms without guard rails.
An electrician fell 22 feet off of a platform on a forklift. The platform slipped off the forks and hit him.	Working on unsafe platform.	Platform not secured to forklift and without guardrails.	Secure platform to backrest of forklift and install guardrails.
A carpenter was electrocuted in the process of connecting the cord plug of an electric drill to a defectively-wired 110 volt receptacle.	Holding drill while attaching cord to receptacle plug.	Faulty electrical wiring of service panel and receptacle.	Always install an approved electrical system and test for safe performance.
A lumber truck helper was killed when struck on the side of head by the lever tool he was using to cinch up wrappers with winches.	Failed to check if ratchet dog was in place.	Inadequate lighting in loading area.	Never perform work without adequate lighting.
An employee was trying to remove a dead fish from reservoir. He lost his footing on the slippery moss on the 45° angle wall, hit his head, and drowned.	Working on slippery surface of sloping reservoir wall.	No safety belt and life line.	Always use a safety belt and life line when working around ponds and reservoirs.
A welder was killed when the suspension ropes failed on the air-powered suspended platform. He dropped 30 feet and was hit by the falling platform.	Failure to use available safety belt with "rope grab" and life line.	Safety belt and life line not used.	Wear safety belt with "rope grab" attached to life line.
A mechanic was using a portable welder in repairing a pump on top of an asphalt storage tank. Tank exploded, killing him.	Welding over tank with asphalt at a temperature of 225° F.	Vapor from asphalt in welding area. Explosive vapor in tank.	Never weld or use open flames near combustible material storage tanks.
An employee had painted a bridge girder and was climbing back to the catwalk when he fell 75 feet to his death.	Wearing safety belt but not tied off.	Working a elevated location without being tied off.	Use safety belts and life lines on all elevated locations and tie them off.
A farm worker operated a tractor while standing on the side platform. He was killed when he fell and the tractor ran over him.	Riding on side of tractor.	No safety belt and not in driver's seat.	Never stand while operating tractor. Use safety belt.
A chemist received fatal burns and six others were injured when a gas line ruptured, caused by a backhoe digging a trench. A passing truck ignited the escaping gas.	Failure to locate underground gas lines before using backhoe.	Area not guarded off.	Always properly locate underground gas lines and guard off area.
A carpenter and crew were removing improperly installed shoring to construct forms. One of the walls fell in burying the carpenter and causing his death.	Removed trench shoring.	Unshored trench.	Properly install shoring so it will not have to be removed when inside forms are erected.
An employee was removing lumps of cement from an air slide screen when a bank of bulk cement collapsed and covered him.	Working next to bulk material pile not trimmed to angle of repose.	Entered an area of unstable material.	Use mechanical means to remove lumps of cement from screen. Trim a pile of bulk material before working near it.
An employee reassembling a trolley fell from overhead travelling crane to his death.	Failure to use safety belt.	Safety belt and life line not used.	Use safety belts properly secured to fastened life line.
An elevator worker riding a skip in elevator shaft was killed when the skip fell six floors to basement.	Riding on an unsecured skip.	Rail clamp safety devices failed to hold.	Never ride on a skip without secured suspension lines.

Offices of the Division of Industrial Safety

MAIN OFFICES

SAN FRANCISCO.....455 Golden Gate Ave. 94102 415-557-1946
Los Angeles.....3460 Wilshire Blvd. 90010 213-381-1332

REGIONAL OFFICES

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San Diego.....1350 Front St. 92101 714-236-7325
San Francisco.....455 Golden Gate Ave. 94102 415-557-1677

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Oakland.....1111 Jackson St. 94607 415-464-0660
Redding.....1421 Court St. 96001 916-246-1621
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Santa Ana.....1624 W. 19th St. 92706 714-547-1603
Santa Barbara.....411 E. Canon Perdido 93101 805-966-2918
Santa Rosa.....750 Mendocino Ave. 95404 707-542-8802
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CALIFORNIA SAFETY NEWS

Vol. 56, No. 2 November 1972

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DIVISION OF INDUSTRIAL SAFETY
Richard Wilkins, Chief

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RESEARCH AND EDUCATION

Sewell A. Knapp, Supervising Engineer and Editor
Marjolaine O'Neill, Graphic Artist

INDUSTRIAL SAFETY BOARD

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Virgil L. Collins, Alan R. Bailey,
Richard K. Humphries, Albert W. Turner

CHIEFLY SPEAKING

On October 16, Governor Ronald Reagan appointed Richard Wilkins as Chief of the Division of Industrial Safety. This ended my very interesting and challenging assignment as Acting Chief of the Division since March 1 of 1972.

During the past few months we have reinforced a philosophy in California of making all places of employment as safe as possible and shutting down immediately all conditions of serious and imminent danger. In addition, the Division of Industrial Safety has been reorganized as one of the first steps of a long journey. There is much uncertainty in the days that lie ahead; however, the Division has done everything possible to maintain a strong safety posture in California and to anticipate and plan for the many problems we are to face.

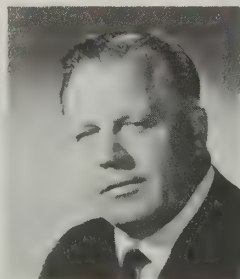
Governor Reagan has given us his strong support in maintaining a good safety program in California.

This is evidenced by his appointment of Richard Wilkins as the new Chief of the Division of Industrial Safety. I have known Dick for 30 years and in addition to being a leader in this field, he is eminently qualified for his new position.

The very best of luck, Dick!



Roy J. Bell



Richard Wilkins
new Chief

WORK INJURIES PUBLICATIONS

The following publications are available from Division of Labor Statistics and Research, P.O. Box 603, San Francisco 94101

- California Work Injuries, 1970 June 1972
- Work Injuries in Mobile Home and Trailer Coach Manufacturing—California..... March 1972
- Work Fatalities in the Forest Products Industries, California, 1971 March 1972
- Work Injuries in the Meat Products Industry—California October 1971
- Electrical Work Injuries in California, 1970 (Issued jointly with the Division of Industrial Safety) October 1971
- Work Injuries in California Public Schools May 1971
- Work Injuries in California Agriculture, 1968 April 1970

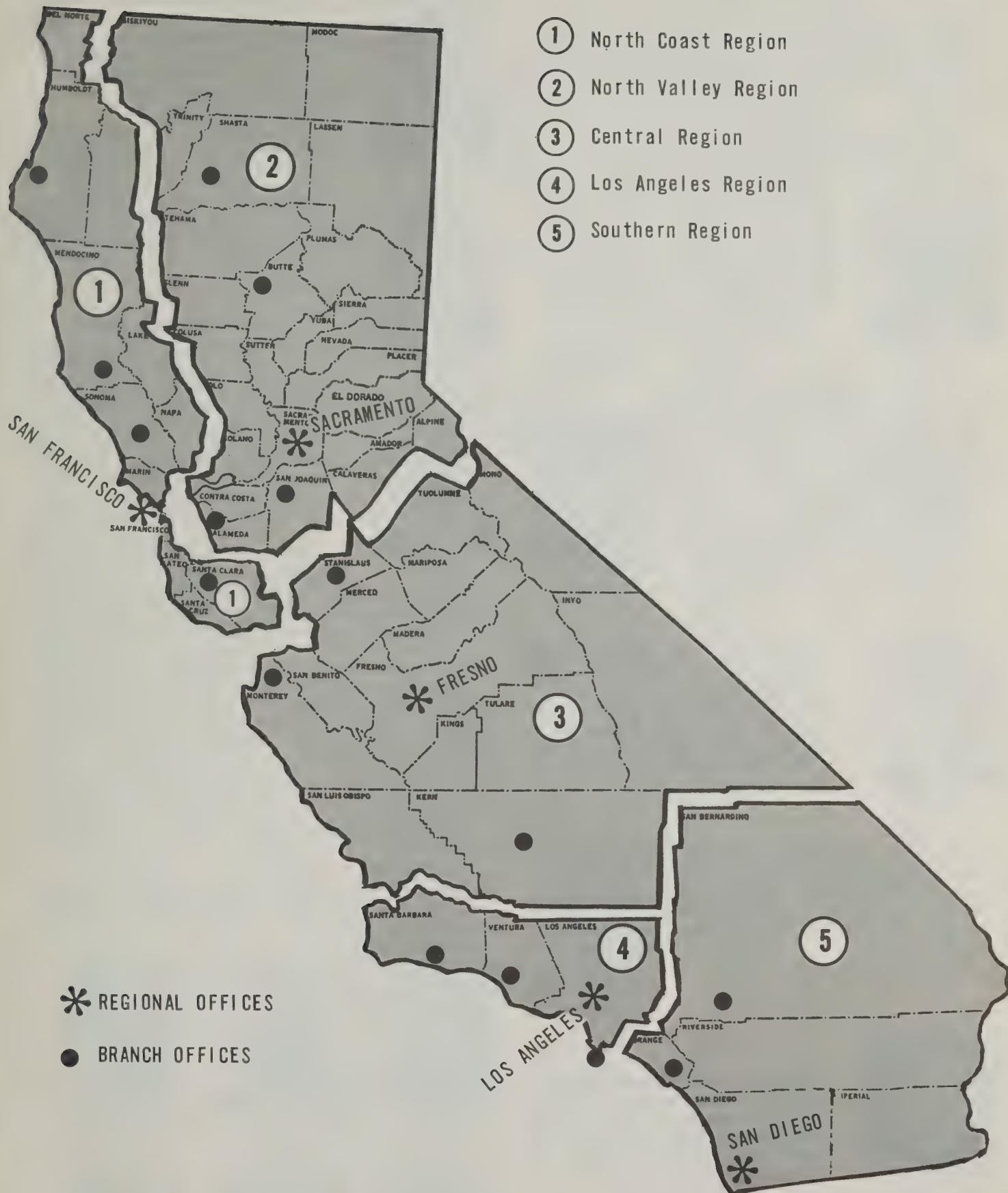
Work Injuries in California Quarterly

Recent issues of the report have featured articles on:

- Work Injuries to Plumbers in the Construction Industry
- Work Injuries Involving Forklifts
- Work Injuries to Employees of Painting Contractors
- Work Injuries in Tunnel Construction

If You Move—

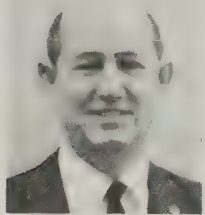
If you move, and wish to continue receiving the CSN, please notify us of your new address.



DIVISION REORGANIZES

In order to provide more efficient service and more effective accident prevention techniques, the Division of Industrial Safety has undergone an almost complete reorganization. The emphasis will be on servicing local problems on a local level speedily, without having to go through the usual long and complicated bureaucratic process.

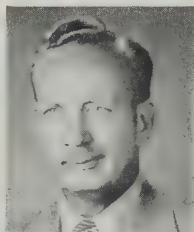
For the purpose of administration, the state of California has been divided into five regions:



Edward Brubaker

The North Coast Region includes the counties of Del Norte, Humboldt, Trinity, Mendocino, Lake, Sonoma, Napa, Marin, San Francisco, San Mateo, Santa Clara, and Santa Cruz. Headquarters are in San Francisco under the direction of **Edward A. Brubaker**, Regional Manager.

The North Central Region includes the counties of Shasta, Modoc, Lassen, Siskiyou, Tehama, Glenn, Butte, Plumas, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Yolo, Solano, Sacramento, San Joaquin, Contra Costa, and Alameda. Headquarters are in Sacramento under the direction of **Paul C. Boettcher**, Regional Manager.



Paul Boettcher



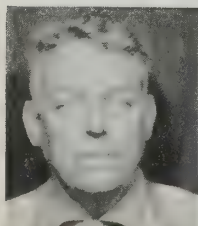
David Valoff

The Central Valley Region includes the counties of Tuolumne, Mono, Inyo, Mariposa, Stanislaus, Madera, Merced, San Benito, Monterey, San Luis Obispo, Fresno, Kings, Tulare, and Kern. Headquarters are in Fresno under the direction of **David M. Valoff**, Regional Manager.

The Los Angeles Region includes the counties of Santa Barbara, Ventura, and Los Angeles. Headquarters are in Los Angeles under the direction of **James H. Heacock**, Regional Manager.



James Heacock



Lyman Ballinger

The Southern California Region includes the counties of San Bernardino, Riverside, Orange, Imperial, and San Diego. Headquarters are in San Diego under the direction of **Lyman W. Ballinger**, Regional Manager.



George Sherman



J. Robert Signer



Vincent White

The three regional managers north of the Tehachapi report directly to **George A. Sherman**, Assistant Chief in San Francisco; the two regional managers in southern California report to **J. Robert Signer**, Assistant Chief in Los Angeles.

These five regional managers represent the Division's line organization and are directly responsible for all industrial safety in their region. If prompt safety service is wanted in a community or plant, the regional manager in that area should be called.

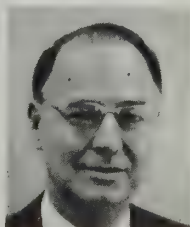
Staff Organization

Backing up these front line commanders is a solid staff organization headed by **Raymond Rodriguez**, Acting Assistant Chief, located in the San Francisco office of the Division.

In charge of special services is **Vincent White**, Assistant to the Chief, also in the San Francisco office.

The Pressure Vessel Section is under the direction of **Melvin Perlee**. The Elevator Section will continue under the direction of **Raymond Rodriguez**, temporarily. The Electrical Section operates under **Eugene Carlton**. The Environmental Engineering unit is headed by **William Steffan**. The Industrial and Construction Sections are now combined as a staff function and directed by **Clifford Farmer**. Percentage-wise the largest expansion among staff units is in the Education and Research unit, supervised by **Sewell Knapp**. This unit will supervise all in-service training of Division engineers and also provide training within industry, maintain a comprehensive film library, and distribute all the Division's brochures on safety subjects. It will publish the *California Safety News*. Working with NIOSH (National Institute of Safety and Health) the section will also distribute some environmental health brochures produced by the Federal government.

Anticipating a step-up in prosecutions, and also the eventual takeover of the OSHA program in California, two legal counsels have been obtained; one will be located in the San Francisco office, the other in the Los Angeles office.



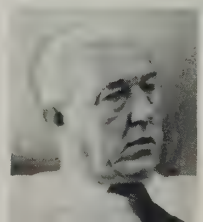
Ray Rodriguez
William Steffan



Melvin Perlee
Clifford Farmer

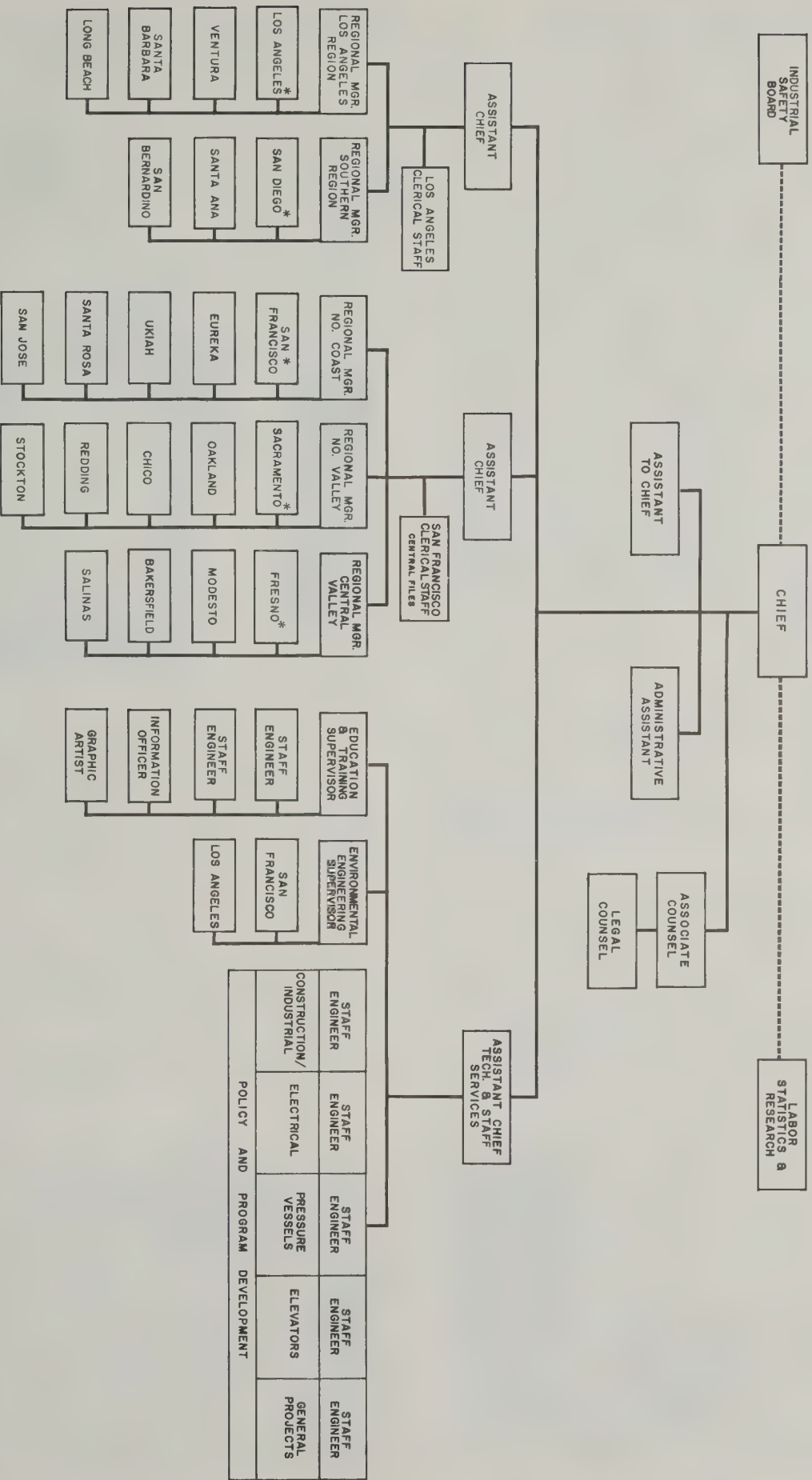


Eugene Carlton
Sewell Knapp



Organization Chart

DIVISION OF INDUSTRIAL SAFETY



* REGIONAL OFFICE LOCATION

REORGANIZATION

Flying Squads

Roy J. Bell, Acting Chief of the Division, innovated a new operation within the Division to provide for the swift and complete massing of Division expertise at a catastrophe. "Flying Squads" have been formed in each region. These flying squads may be called into action by any field engineer of the Division, since he is often the first to hear of the accident and the first at the scene. The actual contact to activate a flying squad will be made with the captain of the squad. The captain will be responsible for assembling his squad at the scene or location of the accident as soon as possible. The principal objective is to have readily available all the expertise of the Division for the express purpose of using all the skills and resources available in order to determine the basic causal factors of the accident.

Nearly all catastrophes attract other investigating agencies such as police departments, fire departments, Office of Emergency Services, etc. The Division squad will not duplicate the work of these agencies. Its major purpose is to direct its effort to the collecting and analyzing of the facts which have directly affected the working people at the site. Each squad will be composed of four individuals; one each from Industrial, Construction, Electrical and Environmental Engineering. In addition, there will be an alternate in each of the disciplines. In the event the captain should feel it necessary to call in engineers from the Pressure Vessel or Elevator Sections, he will do so immediately.

Larry McCune, Division senior safety engineer in charge of mining will be available statewide in the event the catastrophe or serious accident is related to mines or mining projects.

Arrangements have been made with the Division of Labor Law Enforcement for use of their investigators on an emergency priority basis. These investigators will be available 24 hours a day to the Division upon request.

Other Agencies

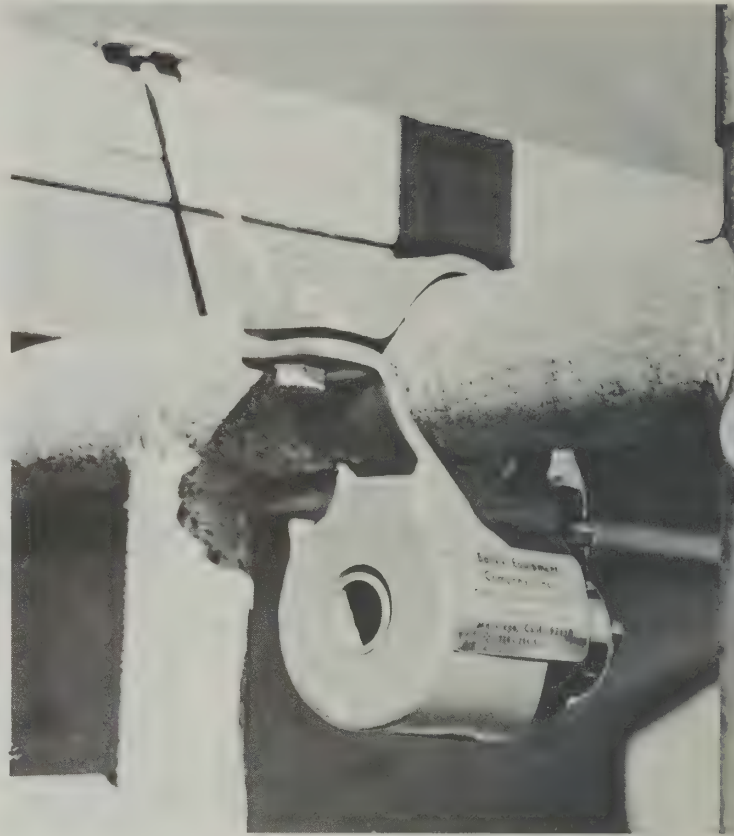
Adding greater strength to the Division's safety efforts is a procedure whereby certain agencies of the State will be notified when serious violations of Safety Orders occur. This particularly applies to violations by contractors. It is believed that compliance will be easier to achieve when a contractor knows that his company's safety record is being reviewed by these various agencies and boards before licenses or contracts are issued.

NEW STAFF COUNSEL

Mrs. Jane Morgan O'Neill has been appointed Staff Counsel for the Division of Industrial Safety with headquarters in San Francisco.

She comes to the Division from private practice in San Mateo County, and is a University of California graduate with a doctorate in law from the University of San Francisco.

Mrs. O'Neill will act as consultant on all legal matters pertaining to the operations of the Division.



Quick Plank Fastener

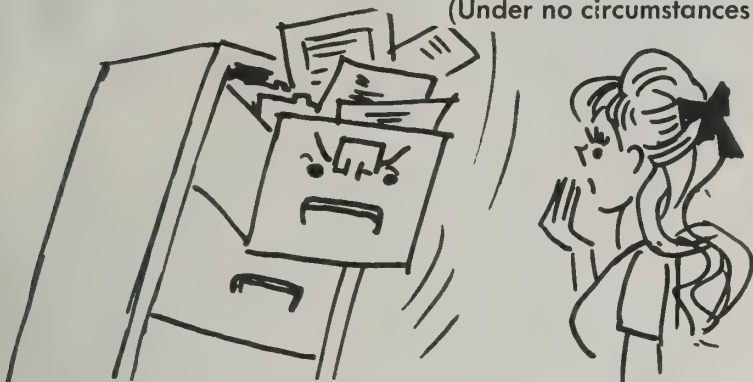
The Beco 500 is a safety device designed for industrial use. When used according to instructions, it will hold scaffolding planking securely in place, preventing accidents caused by scaffolding planks slipping out of position, adding rigidity to the structure and decreasing exposure to injuries.

The device comes complete with cable to secure up to four 2" x 10" planks to the framing with additional cable available to secure as many planks as desired. The positive locking mechanism will prevent such planks from moving under ordinary day-to-day usage. It can be installed by company employees or professional erectors in approximately three minutes for the first installation, and in seconds thereafter. The unit is compact, of rugged construction, with no protruding handles, and has a positive lock.



An Open Letter to the Lady in the Office

(Under no circumstances may a man read this!)



I should like to introduce you to an accident about to happen. It involves you and an item of equipment that is found in most every office. This thing that is about to get you is quite innocent looking but can be hazardous or even deadly. It is called a filing cabinet.

NOW, LET'S SET THE STAGE:

You are a pretty, intelligent and most efficient secretary. You have a mean boss and he is always in a hurry for things. It is also true that it gets progressively harder to get to the second, third, and fourth drawers of your filing cabinet (especially in a tight skirt and/or girdle). So, it is perfectly logical that you arrange your filing system something like this: in the first or top drawer, are filed things that he needs immediately or two hours ago, and since he always wants things immediately or two hours ago, this drawer is packed full. In the second and third drawer are things that are not needed too often and are thus not very full. In the bottom drawer is your lunch, your purse, and a pair of rubber overshoes you forgot to take home last week when it stopped raining.



O.K., ACTION!:

The boss comes in shouting (he always shouts as if you were quite hard of hearing) "I want the file on Circle Cab Co. right now". You jump up from your nice comfy chair, stand directly in front of the cabinet and pull out that 200-pound top drawer. As the pain in your back slowly subsides, you start looking for that file. "Now, let's see," you say to yourself, "He wants Circle Cab Co.

which he, as dumb male, probably thinks should be filed under the "C's" at the front end of the drawer." But feminine logic enters in here. "The first name of the company is Circle, right? Right! And, everyone knows that a circle is a round "O", so where do we find it? Under the "O's" naturally, which is toward the back of the drawer."

Now, it is a well-known engineering principle that if the center of gravity of an object falls somewhere outside its base, that object is in a very unstable condition. It is also an engineering fact that 200 pounds hanging two feet outside the base of an object exerts an overturning force of 400-foot pounds and since you only have a few odds and ends weighing very little (except your purse, of course) in the bottom part of the filing cabinet to offset this overturning force, you end up, if you are lucky, with a bruised behind and a filing cabinet in your lap.

It is a matter of record though (if you will pardon the pun) that each manufacturer puts a little metal plate on the top of the front of his cabinet. Now, when this cabinet falls, the tag hits you on some nice spot on your body, leaving a more or less permanent imprint that says:

**STENIBAC EMCA
SREWARD NEPO YSAE**

Very strange, but when you look in your mirror at home, this now says:

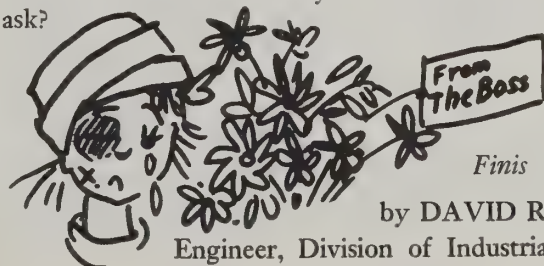
**ACME CABINETS
EASY OPEN DRAWERS**

End of Act One

Act Two starts with your opening the top drawer part way and then remembering something you need in one of the bottom drawers. Of course, you forgot to close the top drawer, right? When you raise up—POWIE! Anyone have a head bandage and some aspirins?

Act Three begins with you leaving the bottom drawer open as your boss comes rushing by the front of the cabinet toward you. Have you ever been tackled by your 200 pound boss? Get the picture?

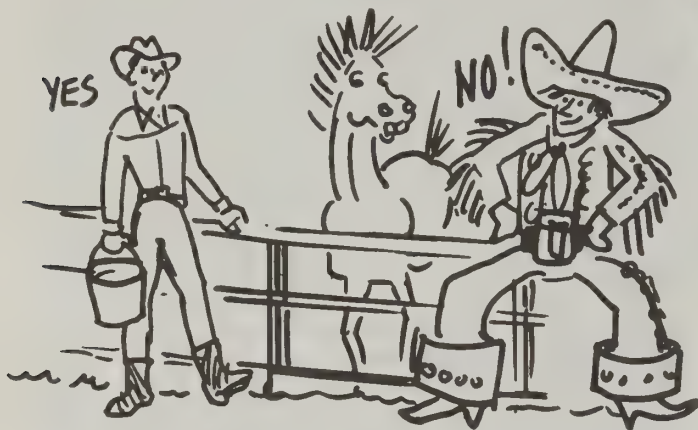
Well, anyway, he did send you flowers, and the doctor and nurses have been very kind. What more can you ask?



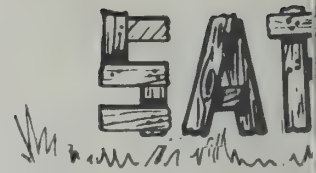
by DAVID R. WEST

Engineer, Division of Industrial Safety

In 1971 in California agriculture 59 workers were killed and 12,449 suffered disabling work injuries. At least 20 of the fatalities and 2,105 of the injuries occurred on places classified as "dairy and livestock" farms and "animal husbandry service". The term "dairy and livestock" refers to beef and dairy cattle, horses, mules, sheep and swine.



R. C. Drew
Safety Engineer
of Industrial Safety



notice, and it's the "gentle" bull that kills more people than the known-to-be-ugly one since the latter is usually kept in a safe bull pen. Don't get in any pen with a bull and don't clean the pen while the animal is in it. Use safety alleys and walkways instead of getting into the pen. When handling bulls always use a staff. Nose rings should be used on obstreperous bulls. Keep the bull in a safe paddock. Your county agent can give you advice on constructing one. You should never enter an open field in which there are bulls when you are afoot; even gentle bulls may become aggressive when cows are in heat.



Switching cow tails are a serious hazard, as many a partially blinded milker will attest. Milkers should wear suitable eye protection and milking barns should be kept reasonably free of annoying flies. Cows that kick should be identified with a painted brand on the flank. A red letter "K" is used by many dairy operators. Horns on dairy and beef cattle can be dangerous; dehorn these animals when young.

General Precautions

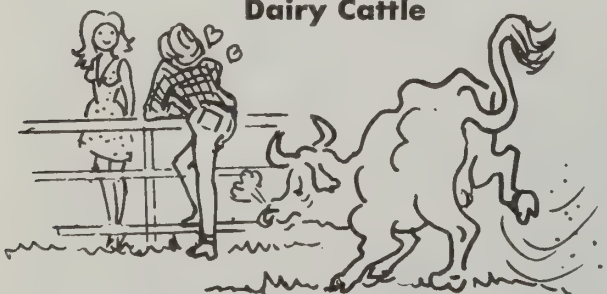
To reduce these injuries certain elementary precautions should be taken.

Wear appropriate clothing. Trousers and pants should be cuffless. Clothing should be close-fitting, not loose. Boots or substantial shoes should be worn. Safety-toe shoes will prevent toes from being crushed. Wear leather gloves while handling hot branding irons, electric de-horners or when roping.

Persons working with livestock should be regularly inoculated against tetanus. Small cuts, scratches and abrasions should receive prompt first-aid treatment. Traveling foremen should keep a first-aid kit in the car or truck.

Work quietly around animals. Don't show fear. Never tease or antagonize animals. Approach them from the front or side to avoid startling them and speak as you approach, especially if an animal is in a stall. If you realize you are about to be kicked and cannot avoid being struck, move toward the animal if close enough—rather than stepping back—as this will reduce the force of the blow. Use special care when handling animals with newborn young. Handle any dead animal with caution, especially if the cause of death is uncertain. Never allow inexperienced or youthful drivers to handle animals without proper instruction and close supervision.

Dairy Cattle



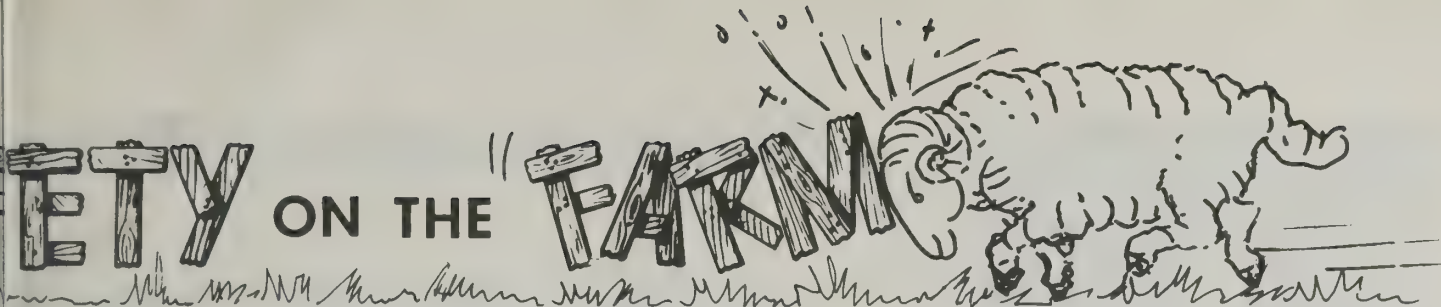
The dairy bull is the most dangerous animal on the farm. He is more active and less tractable than beef bulls; however, all bulls should be considered dangerous. The older the bull the more dangerous he becomes. The bull that has always seemed gentle may turn on you without

Beef Cattle

When cattle are being dehorned, branded, sprayed, inoculated, or castrated suitable calf tables, cattle squeezes, branding chutes or stocks should be made available and used. These should be kept in good repair. Dehorning spoons, tubes, clippers, and saws must be kept sharp and be reasonably clean and sterile. When dehorning the animal make sure the head is held firmly and point the tools away from your body. Portable electric dehorning saws must be electrically grounded; portable electric clippers must be grounded also, or be doubly insulated. When dipping sheep, use caution. Phenol (carbolic acid) is the primary chemical in some sheep dip. It can cause serious skin burns, even blindness to the operator. It is particularly dangerous when mixing solutions. Wear protective equipment for eyes and skin. Other dips may also contain chemicals that can be hazardous to eyes and skin.

Electric Fences

An electric fence can be dangerous and you should always check with your local building department, agricultural extension engineer, or the electrical section of the Division of Industrial Safety for regulations concerning the proper installation and use of electric fences.



The fence wire should be fastened to the posts by insulators. Inexpensive porcelain or solid glass insulators should be used. Never use necks of bottles or old rubber. Fence wire should never be permitted to come in direct contact with the posts, weeds, or the ground.

Never use full house current at 110 volts without a special transformer to reduce the current. Fence controllers should be bought from a reliable manufacturer because "homemade" controllers may be dangerous. One lead from the controller should be grounded to a pipe driven into moist earth. Never ground an electric fence to a water pipe because it could carry electricity directly into connected buildings. A lightning arrestor should be installed on the ground wire. Don't use rusty wire on electric fences as rust on an insulator can carry electricity.

If alternate routes are available, an electric fence should not be placed across standing water or on areas that are commonly wet. Wear gloves when installing or repairing fence wire.



Swine Safety

The tusks of boars are a serious hazard for they can easily slash a worker's leg to the bone. Cut boar tusks short. Swine generally should be treated with great respect. They are carnivorous animals. Small children should not be permitted to enter their pens or any enclosures or pastures where they may be kept. A sow with a litter can be a very dangerous animal and extreme caution must be used in handling her. A boar is dangerous at all times and should never be handled by untrained or inexperienced workers.

A serious health hazard can be avoided if you use a pitchfork or shovel to handle aborted swine fetuses or swine placenta. Do not use your bare hands. These precautions should be observed also with other livestock fetal material. When mixing sodium fluoride into dry feed for roundworm treatment of swine always wear an approved mechanical filter respirator. Proper personal protective equipment such as rubber boots, rubber gloves, rubber apron, plastic face shield or chemical goggles should be worn also when using lye solutions and steam to clean farrowing pens.

When preparing a lye solution add the chemical, sodium hydroxide, slowly to the surface of the water to avoid violent spattering. Lye is extremely corrosive and can cause severe burns to the eyes and skin if it contacts them. First-aid treatment for lye burns is to wash the eyes or skin with clean, potable water for at least 15 minutes and neutralize with strong vinegar. Then, if the eyes are involved, check with a physician promptly.

Handling Sheep

Rams should be handled with care as they attack by butting when you least expect it. When sheep shearing is going on, the catch pen and turn-out pen must have proper gates or other barriers to prevent the sheep from dashing across the shearing floor while the shearers are at work.

If canvas or other fabric is used for floors in sheep shearing pens, it should be stretched taut and pegged down at 4-foot intervals around the outer border to prevent bunching or gathering of the material. The fabric must be kept tight at all times to avoid a serious tripping hazard.



Horses and Mules

When leading a horse or mule, walk beside it, not in front of it. When driving a horse or leading an animal on a rope, don't tie or wrap the lines around your arms or waist. Wear riding boots. Keep stirrups snug to avoid getting a foot caught in one. Wear leather chaps when riding through brush-covered rangeland. Use care in tying equipment on a horse so that it cannot work loose, flap around or rattle; pad sharp objects well. Make a habit of tying or buckling a cinch correctly and check it periodically.

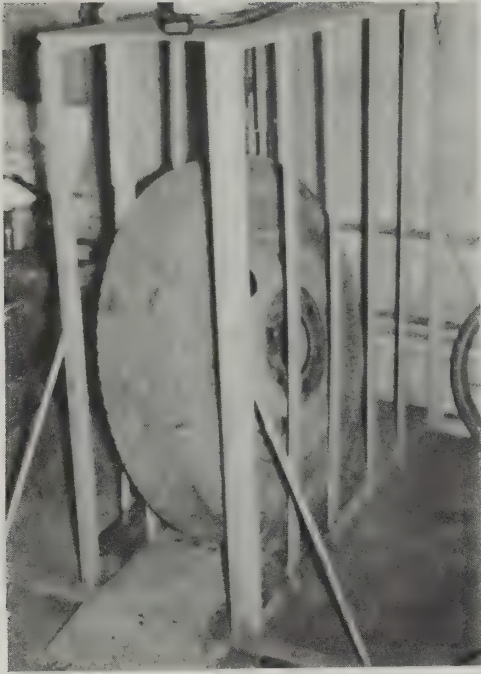
Use extra caution when handling a stallion, particularly when breeding him to mares. Do not permit small children to enter a stallion's corral.

Wear a leather or heavy canvas apron when shoeing horses. Bend and clinch nails one at a time as they are driven in to avoid injury from their sharp points.

Gates and fences in corrals and cattle yards should be inspected regularly and properly maintained. Fencing on feed lots should be particularly strong. Crowding pens and chutes being subjected to heavy use should be inspected quite often.

Use extreme caution when loading cattle into trailers or trucks. Avoid being trapped and possibly crushed by an animal in the forward, confined area of the trailer or truck bed. Provide escape exit doors on the forward end of all trailers and trucks.

Division Adopts Tire



Tire mounting cage

Due to an increasing number of fatalities and severe injuries that have been occurring to employees while mounting and repairing truck and automobile tires, the Safety Board of the Division of Industrial Safety has adopted a set of safety orders, now in effect, governing the mounting of tires. The following are the safety orders:

3325. Tire Inflation Equipment. (a) Tire inflation shall be accomplished by means of a clip-on chuck with a minimum 24-inch length hose to an in-line foot or hand valve and gauge. A clip-on chuck and an in-line regulator (factory preset at 40 psi maximum) or a restraining device may be used as an equivalent.

Exception: Automatic tire inflation machines that inflate the tire in a pressurized chamber through the bead seat annulus.

(b) Tire inflation control valves shall automatically shut off the air flow when the valve is released by the operator or be of the preset regulator type.

(c) A tire restraining device, such as a cage, rack, or other effective method shall be used while inflating tires mounted on split rims or having retaining rings.

Exception: While the wheel assembly is mounted on a vehicle, tires may be inflated without a restraining device, provided that remote control inflation equipment is used and all persons stay out of the danger area.

3326. Safe Practice for Mounting and Inflating Passenger Car and Other Drop Center Wheel Tires. (a) Every employer shall post and enforce a safe practice procedure for changing and inflating tires, including the appropriate rules listed below:

(1) Carefully inspect the rim flanges, bead seating surfaces, and tire for defects and foreign particles. Clean any contaminated surfaces.

(2) Mounting and demounting of tire shall be done from the narrow ledge side of rim.

(3) Lubricate the beads and rim surfaces with a lubricant that will not deteriorate the rubber.

(4) For greater safety, the valve core should be installed in the valve stem prior to inflating.

(5) The hold-down cone shall be loosened but not removed before inflating the tire unless otherwise directed by the manufacturer.

(6) If a bead expander is used to seat the beads, it should be removed before the tire is inflated more than 5 psi.

(7) Avoid taking a position over the tire during inflation. Stand out of the line of trajectory.

(8) If the beads have not seated by the time the pressure reaches 40 psi, deflate the assembly, relubricate, reposition the tire on the rim, and then reinflate. Do not apply lubricant to a hung-up tire bead while under pressure.

3327. Safe Practice for Mounting and Inflating Tires with Split Rim and/or Retainer Rings. (a) Every employer shall post and enforce a safe practice procedure for changing or inflating split rim or retainer (lock rings) type tires, including the appropriate rules listed below. Only specially trained personnel shall be assigned to this work:

(1) Completely deflate the tire by removing the valve core before doing any work.

(2) Inspect the rim parts and tire for defects, damage, and foreign particles. Clean the wheel parts and tire as necessary.

(3) Rim parts of different manufacture or rim parts designed to fit a different size or type of rim shall not be used. Side and lock rings which are bent out of shape, heavily rusted, or broken shall be replaced.

(4) Lubricate the beads and rim surfaces with a lubricant that will not deteriorate the rubber or cause the rim to rust.

(5) Securely install the tire and properly reassemble the rim as required.

(6) Never inflate a tire that has been run extremely low or flat.

(7) A tire restraining device, such as a cage, rack, or other effective method shall be used while inflating tires mounted on split rims or having retaining rings.

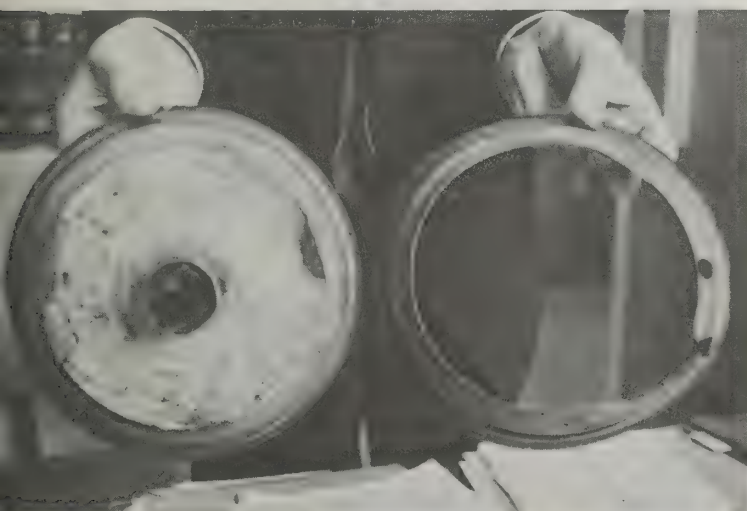
Exception: While the wheel assembly is mounted on a vehicle, tires may be inflated without a restraining device, provided that remote control inflation equipment is used and all persons stay out of the danger area.

(8) A clip-on chuck, sufficient length of hose, and an in-line, hand-operated valve with gauge shall be used to inflate tires so that the operator can stand out of the danger area. A regulator that is preset to a desired pressure will be considered equivalent to the in-line hand valve with gauge.

(9) Inspect the tire rim and ring to make sure it is properly seated and locked. If more work on the rim or ring is necessary, before doing such work, always deflate the tire by removing the valve core. Don't attempt to correct seating of side and lock rings by hammering while tire is inflated.

(10) Inflate tire to manufacturer's recommended pressure prior to removal of restraining devices.

Mount Orders



Example of rim failure

Safety Orders Available

While the Division of Industrial Safety distributes many free brochures and other safety information (see following pages) the Safety Orders are available only in Sacramento and there is a small charge made to cover printing costs.

Safety Orders of the State of California are available from Office of Procurement, Document Section, P. O. Box 20191, Sacramento, California 95820.

All sales are subject to payment in advance. Money orders or checks should be made out to State of California. Add 5 percent sales tax for California addresses. There is a 10 percent discount on orders of fifty (50) or more of same title. Minimum sale is .50¢ and stamps are not acceptable.

Price List		WITH SALES TAX	
CALIFORNIA SAFETY ORDERS			
Aerial Passenger Tramway Safety Orders	\$0.75		\$0.79
Boiler and Fired Pressure Vessel Safety Orders .....	.75		.79
California Shaft Bell Signals (on oil cloth)	1.50		1.58
Compressed Air Safety Orders .....	.75		.79
Construction Safety Orders	2.00		2.10
Electrical Regulations (See Title 24, Part 3, below) *			
Elevator Safety Orders	2.00		2.10
General Industry Safety Orders	2.00		2.10
Logging and Sawmill Safety Orders	2.00		2.10
Mine Safety Orders	1.00		1.05
Petroleum Safety Orders, Drilling and Production	1.50		1.58
Petroleum Safety Orders, Refining, Transportation and Handling	1.50		1.58
Pneumatic Explosives Loading Safety Orders; Quarry and Open Pit Mine Safety Orders	1.00		1.05
Ship and Boat Building Safety Orders.....	.75		.79
*Title 24, Part 3 (Basic Electrical Regulations)	3.00		3.15
Tunnel Safety Orders	1.00		1.05
Unfired Pressure Vessel Safety Orders.....	1.25		1.31
Window Cleaning Safety Orders	1.00		1.05
INSPECTION REPORT FORMS (price listed is per pad of 50 forms)			
No. S-152—Elevator Inspection Report ....	.57		.60
No. S-217—Elevator Reinspection Report..	.35		.37
No. S-600—Boiler Report .....	.62		.65
No. S-601—Unfired Pressure Vessel Report .....	.40		.42
No. S-602—Liquefied Petroleum Gas Installation Report .....	.40		.42

ELECTRICAL SAFETY STANDARDS

The California Industrial Safety Board, at its June 13, 1972 meeting, directed the Division of Industrial Safety to appoint an ad hoc committee to explore the acceptability of the ANSI electrical plug and receptacle configuration safety standards.

This committee's findings would be used to guide the Board in its deliberations concerning the possible adoption of this National consensus standard.

Establishment of the ad hoc committee was accomplished and the committee met Friday, July 21, 1972, in San Francisco. The committee members reviewed the new ANSI configuration standards and found them to be acceptable and if used properly would eliminate the problem of interchangeability. The committee members by a vote of 16 to 4 recommended that the Board should adopt the new ANSI standards for the construction industry. A second vote was taken to see how much lead time would be necessary for the construction industry to have the new configurations in use on construction sites. It was pointed out that the new plugs and receptacles were now available in sufficient quantity to supply the construction industry in the State of California. However, the committee voted unanimously that the adoption of the ANSI standards should become effective and required at all construction sites six months after the effective date of the orders.

Until action is taken by the Board, contractors may use the old configurations or the new configurations providing they adhere to the following requirements:

- (a) All attachment plugs and receptacles on construction job sites shall be maintained in a safe state of repair equivalent to the original equipment; and
- (b) The attachment plugs and receptacles shall be suitable for the application for which they are used and be properly wired; and
- (c) Receptacles connected to circuits having different voltages, frequencies, or types of current (A.C. or D.C.) on the same premises shall be of such design that the attachment plugs used on such circuits are not interchangeable; and
- (d) Each attachment plug and receptacle shall be installed and used only on circuits having overcurrent protection in conformance with the provisions of the Electrical and Construction Safety Orders of the Division.

Also discussed was the interchangeability of certain 3 pole 120- and 240-volt locking-type attachment plugs of the 20- and 30-ampere rating with the 50-ampere locking-type receptacles commonly used for 125/250 volts on construction sites. A serious hazard exists because these 20- and 30-ampere devices may be inserted into the 50-ampere receptacle in all three positions. To eliminate this hazard, it will be necessary to replace this 50-ampere locking-type attachment plug and receptacle with one of an approved design which will prevent this interchangeability.

At least one manufacturer is making a suitable 50-ampere locking-type receptacle which will reject the in-

sertion of all attachment plugs not specifically designed to be used with the receptacle. The committee recommended that this unit also be included as part of the California configuration standards. Inasmuch as there is only a limited supply of the approved 50-ampere locking-type attachment plug and receptacle combinations available at this time in California, the Division of Industrial Safety will recognize the following temporary measures to control the hazard:

- (1) All 50-ampere locking-type receptacles shall be fitted with lockable covers and kept locked during the time the proper mating 50-ampere attachment plug is not inserted; or
- (2) The 50-ampere locking-type attachment plugs and receptacles are replaced with higher ampere rated devices of such design that they are not interchangeable with other devices on the premises. (The Division will temporarily recognize larger rated devices on 50-ampere cable assemblies, provided the overcurrent protection of the circuit is limited to 50 amperes); or
- (3) The elimination of the 50-ampere locking-type attachment plug and receptacle by connecting the cable assemblies directly into the equipment.

The ad hoc committee's report is being developed at the present time and will be submitted to the Industrial Safety Board.



Trench Permits Required



Worker in unshored trench.



Section 6424 of the California Labor Code, effective March 4, 1972 requires contractors planning excavation or trench work to obtain a permit for such work if the excavation is over 5 feet deep and men will be exposed to the hazard of moving ground.

The usual work permit given by cities, counties and other municipalities will satisfy this requirement provided those issuing the permit will also inspect the work for the safety of workmen.

The wording of the section is as follows:

ARTICLE 6. EXCAVATIONS, TRENCHES, EARTHWORK

1539. Permit to Excavate. Every employer who is required under the provisions of Labor Code Section 6424 to obtain a permit from the Division of Industrial Safety prior to construction of a trench or excavation will be charged a fee for such a permit in the amount of twenty-five dollars (\$25). One permit can cover more than one excavation on each project.

Note: Permits are not required for trenches and excavations if they meet one of the following conditions:

- (a) The work will be done without any employees.
- (b) The trench or excavation will be less than five feet deep.
- (c) The excavation work will be done by employees of any agency of the State, a city, city and county, county, or district.
- (d) The job will be done by a public utility which is subject to jurisdiction of the Public Utilities Commission.
- (e) The applicant has or will get a permit from an agency of the State, a city, city and county, or county which will also be the inspecting agency of the excavation or trench work.
- (f) The trench or excavation is intended for emergency repairs to underground facilities.
- (g) The work will be such that no person will be required to descend into the excavation or trench at any time.
- (h) The proposed excavation will be a grave.

If the municipality issuing the permit will not inspect for safety, a permit must be obtained from the Division of Industrial Safety. To get a permit, request an "Application for Permit to Perform Excavation or Trench Work" from any Division office in the State. Return the application in duplicate with a \$25.00 fee to any Division office. Checks should be made payable to Division of Industrial Safety.

If, for any reason, permit is not issued, applicant will be so advised and fee returned.

PUBLICATIONS AVAILABLE

The following bulletins and placards are available to those interested in accident prevention. Requests for material should be sent to Division of Industrial Safety, Educational Section, 455 Golden Gate Avenue, San Francisco, California 94102, or to Division of Industrial Safety, Educational Section, 3460 Wilshire Blvd., Los Angeles, California 90010.

If you require 500 or more copies you may obtain price quotations directly by writing to: Documents Section, P.O. Box 20191, Sacramento, California 95820. Then place your order with them.

BULLETINS

S-103 "Safe Handling of LP Gas" gives the use and characteristics of LP gas and rules for safe handling.

S-107 "The Ship-Shape Shop" shows the value of good housekeeping.

S-108 "Taming the Circular Saw" deals with a useful but dangerous tool.

S-109 "Safety Films Available from the State Division of Industrial Safety."

S-110 "Tips for Hotel Workers" is a guide to safety in hotel work.

S-111 "Farm Safety Check List" is a safety guide for everyone on the farm.

S-117 "Stop Grinding Out Injuries!" describes abrasive wheel precautions.

S-120 "Safety Rules for Painters" shows how to prevent injuries to painters.

S-122 "Handy Rules for Hand Tools" describes the proper care and use of many common tools.

S-123 "Three Steps for the Safe Use of Portable Ladders" explains how to avoid ladder accidents.

S-124 "Safety Rules for Roofers" alerts to dangers and gives precautions against slips and falls, tar burns, strains and ladder injuries.

S-125 "Are You Using Carbon Tet?" deals with a hazardous chemical.

S-127 "Look Out for Yourself When Around Crop Spraying" is directed to farmworkers. (Also available in Spanish.)

S-128 "If You Work in a Quarry" covers quarry and open-pit mine workers.

S-135 "Check List of Requirements" is a guide for employers, safety engineers, and purchasing agents on what to check before buying or renting equipment or placing contracts.

S-137 "Skin Trouble Is Plenty Trouble" deals with the most common disease you can get at work.

S-141 "Power Hand Saw Safety" gives causes of power hand saw injuries.

S-142 "Live With the Label" cautions users of hazardous substances.

S-143 "Trade Association Safety Programs" reveals their value.

S-145 "Safety Publications Available from the State Division of Industrial Safety."

S-146 "Safety in Pipeline Construction" tells how to plan and organize pipeline jobs and how to insure safety in various phases of the job.

S-147 "The Safe Use of Anhydrous Ammonia in Agriculture" discusses the three most important things which make anhydrous ammonia safe to use.

S-148 "The Safe Use of Aqua Ammonia in Agriculture" describes necessary precautions for safe use of aqua ammonia.

S-150 "Electrical Safety and Swimming Pools" describes precautions to take to make swimming pools safe electrically.

S-153 "Electrical Safety on the Farm" tells how to guard against electrical hazards.

S-154 "The Tailgate Safety Meeting" gives pointers on effective means to promote on-the-job safety.

S-156 "Guard Standards No. 1 — Materials and Construction" gives invaluable advice on constructing guards and selecting right material for them.

S-158 "Protection of Workmen in Trenches" describes the measures that will reduce the heavy death toll in excavation work.

S-160 "Confined Space Can Be a Death Trap!" Describes hazards of work areas where poisonous gases can build up or oxygen be lacking—sewers, tank cars, vats, shafts, barges, silos, etc.—and what to do about this danger.

S-415 "Your Life May Depend on a Safe Scaffold" gives requirements for a safe scaffold.

S-657 "Accident Prevention Program for the Construction Industry" contains requirements every construction employer must observe.

S-802 "Lock Out Block Out" tells how to safely lock out or block out machinery or equipment.

S-803 "Standard Whistle Signals for High Lead Logging" gives complete set of signals.

S-804 "Fork Lift Truck Operation" safety and common sense in material handling by fork lifts. States rules and gives accident prevention tips.

PLACARDS

S-101 "Safe Handling of LP Gas" gives safe procedures for handling and installing LP gas units. (5½" x 8½")

S-611 "Construction Hoisting Signals" gives bell or whistle signals required by the Construction Safety Order 1612(c). (5½" x 7")

S-612 "Notice! Fuse Used Here Burns at the Rate of One Foot in — Seconds." (8½" x 11")

S-615 "Stop Machinery Before Oiling, Cleaning, Repairing." (8½" x 11")

S-617 "Wear Goggles. You Can Get Used to Goggles—But Never to a Glass Eye." (8½" x 11")

S-627 "Caution! Don't Go Between Brow Log and Load. Don't Dump Logs Until All Men Are Clear." For use at log dumps and ponds. (8½" x 11")

S-634 "Responsibilities Prescribed in California Labor Code." It lists these for employer and employee in matters of safety. (8½" x 11") (Also in Spanish S-634-S)

S-800 "Hand Signals for Boom Equipment Operation" shows approved arm and hand signals in diagrams. (8½" x 11")

S-801 "The ABCs of Safety" is an amusing alphabet in which every letter relates to safety. (8½" x 11")

They Needn't Have Died

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
A plant engineer started to cut the top out of an empty drum with an oxygen-acetylene torch. The drum blew up killing him.	Burning into a drum containing explosive vapors.	Explosive vapor in drum.	All empty drums must be purged before cutting starts.
A farm laborer was killed when crushed between tractor and truck. Other employee started tractor by shorting starter switch while standing on ground and not in control of tractor.	Starting tractor while standing on ground.	Faulty switch causing employee to jump the wires from ground.	Provide adequate maintenance. Never allow employees to start tractor while not in control.
A buckner was killed when a snag fell the wrong way and hit him.	Bucking too close to faller.	No escape path for buckner.	Faller and buckner should work a safe distance apart.
A water truck driver was killed when a bridge collapsed and truck and tank fell fifteen feet.	Failed to check bridge support.	Rotten main logs and timber under fill spout.	Always check supports on structure where truck must park.
Trucks carrying lumber use wooden flat tops to protect dry lumber. Trucker was returning these tops to mill. He removed two wrappers without restraining load. Wind blew tops off truck on to him.	Removing wrappers without restraining load.	Wooden tops not securely fastened.	All wooden tops or other lumber loads should be restrained before wrappers are removed.
A tree trimmer was killed when the elevated bucket caught in a limb. A wrong procedure allowed slack cable and the employee was beaten to death when bucket fell and bounced like a yo-yo.	Correct operational procedure not followed.	No safety belt. Slack cable.	Use safety belts. Follow operational instructions.
A locking ring flew off a truck tire being inflated and killed a service station attendant.	Failure to use tire cage.	Unguarded truck tire being inflated.	Always use a safety cage when inflating truck tire.
An employee was working around a horizontal revolving shaft. He became entangled and was killed.	Wearing loose clothing around revolving shaft.	Revolving shafting. Not guarded.	Don't wear loose clothing around moving machinery. Guard revolving shafting.
A warehouseman went under a hydraulically controlled elevator to retrieve a box. The elevator descended, crushing him.	Getting under an automatic lowering device.	Automatic lowering device not guarded.	Lowering platforms should have two-hand control.
An employee on a clean-up gang climbed into a mixer to finish cleaning the inside. Another employee started the mixer.	Failure to lock out switch before entering blender.	Open mixer under power.	Always lock out switch to prevent energizing equipment worked on.
A helper was returning a skid loader to the shop when it went over an embankment and turned over on him.	Driving skid loader backwards.	No roll-over protection.	Drive machine forward. Use roll-over protection.
An employee entered a manhole for an unknown reason. There was no stand-by worker and no ventilation at the time. He was dead when pulled out.	Entering a manhole without a stand-by man.	Buildup of CO ₂ in confined space.	Never enter a confined space without ventilation, a life line and a stand-by man.
An apprentice worker cut into a drum that contained an explosive mixture without filling drum with water as instructed.	Cutting into a drum containing explosive mixture.	Drum containing explosive mixture.	Always purge or fill with water before cutting into drum.
An employee was working under an upraised dump truck body. He was killed when body fell on him.	Working under an unblocked raised dump truck body.	Blocking had been removed from under body.	Never work under a raised truck body that is not blocked.

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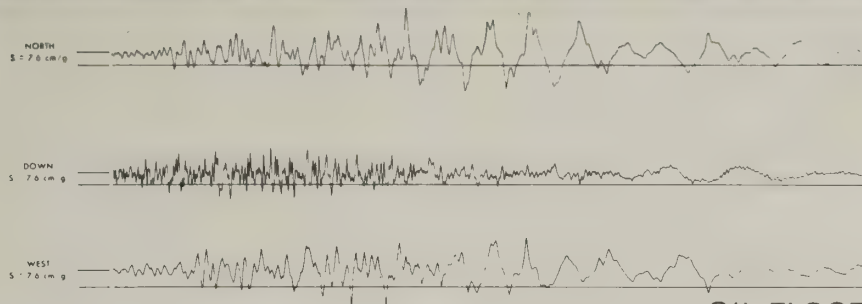
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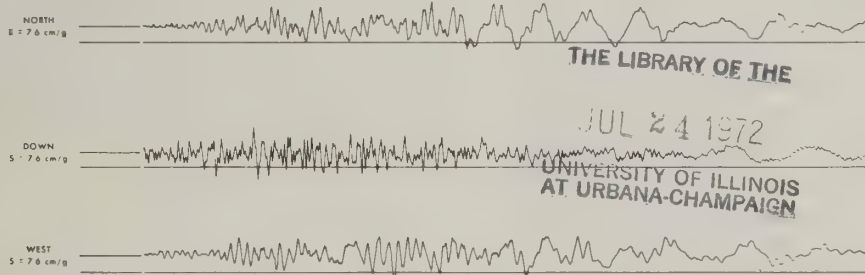
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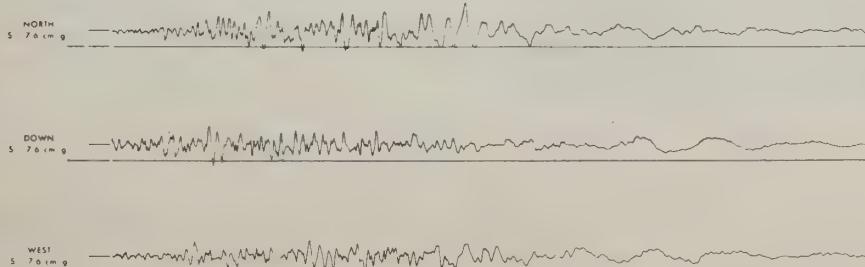
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Ronald Reagan, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
William C. Hern, Director

DIVISION OF INDUSTRIAL SAFETY
Roy J. Bell, Acting Chief

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RESEARCH AND EDUCATION

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Chiefly Speaking

Too many California employers close their eyes to job hazards until State inspection of their workplace forces compliance with safety standards. That kind of attitude creates a burden on a vital, tax-supported program and adds up to a kind of waiting game in which everybody loses.

Employers who wait for legal enforcement of safety standards make an accident target out of their workers and mark themselves as suspected law breakers. Consequently, employers must take a long, hard, and critical look at working conditions in their places of employment to make sure hazards are under control. Effective accident prevention—the kind that protects workers from injury or death—cannot wait until a State safety engineer makes his inspection.

The State Labor Code is very clear in placing the primary obligation for job safety on employers. Furthermore, the history of industrial safety certainly shows that effective accident prevention depends upon the support that employers give these kinds of programs.

State enforcement of industrial safety laws is only a part of accident prevention. There are other alternatives if we are to continue to reduce job injuries. The alternatives for employers begin with a commitment to prevent accidents. Once that is made, management must sponsor the components of a workable program which includes:

- knowledge of the minimum safety standards for the particular business or industry, including copies of California Safety Orders;
- key employees to keep abreast of the latest safety procedures methods, and equipment;
- assessment of existing safety and health conditions including analyses of hazards for every job;
- training program for employees to alert them to job hazards and means of eliminating them;
- investigation of every accident, and detailed analyses of causes of those accidents causing injury or death;
- information programs to make sure the causes of all accidents are known by employees;
- specific safety goals with the means to measure progress toward those goals.

If every employer would adopt such a safety program, the number of industrial accidents would decrease, and, in turn, we would see significant savings in terms of pain and suffering, time lost from the job, and costs associated with accidents.

Roy J. Bell



New DIS Chief

Roy J. Bell took over as acting chief of the Division of Industrial Safety on March 1, replacing Jack F. Hatton who resigned after serving as head of the Division for five years.

The new Chief was first appointed by Governor Ronald Reagan as Administrative Director of the Division of Industrial Accidents, State Department of Industrial Relations, in January of 1967. He continues to serve in that position while also heading Industrial Safety.

Before entering State service, Bell directed safety and public affairs programs at the Hughes Aircraft Company, Culver City, for 15 years. His responsibilities there included medical, health, safety, and workmen's compensation programs.

During his career in private industry, he also served two terms as chairman of the Workmen's Compensation Committee of the California Manufacturers' Association, and five years as chairman of the Technical Committee on Workmen's Compensation. He was also chairman of the Aerospace Industrial Safety Committee.

The native of Missoula, Montana, moved to Southern California in 1921 where he lived until his appointment in 1967. He is 60 years old.

When a firm's safety record is good enough to earn it the "Award of Honor" of the National Safety Council, then it has to be doing quite a few things right. Shown here is John E. Cooley (center), manager of the Mendota plant of Spreckels Sugar, proudly showing off the award with Frank Warren (left) and David Valoff (right) safety engineers in the Fresno office of the Division of Industrial Safety. The Spreckels safety engineer, John Mills, described the main parts of the company's successful program which includes employee safety committees in which management participates, frequent tailgate meetings, and effective year-around safety promotions.



ROPS can prevent farm tractor deaths

Michael Divjak, Safety Engineer
Industrial Section, State Division of Industrial Safety

Question—Why is roll-over protection for operators of farm tractors included in the revised Safety Orders?

Because of the 1,000 farm tractor fatalities in the United States every year, about 10 deaths are caused by overturns; and overturns are equally serious on California farms.

Question—With no roll-over protection, what are an operator's chances of surviving a tractor overturn?

Less than a 50-50 chance of coming out alive.

Question—What can be done to prevent deaths from overturn of farm tractors?

Preventing these accidental deaths requires: 1. Safe operating procedures; and 2. Protection for the operator in the event of an overturn.

Question—How do the revised Safety Orders protect the operator?

California Safety Orders have always required safe practices. Now the revised Safety Orders also require an approved roll-over protective structure (ROPS) on farm tractors. Statistics show that fatalities among farm tractor operators are greatly reduced or eliminated when ROPS and seat belts are used.

Question—What is an approved ROPS?

A ROPS meets the requirements after it has undergone engineering tests and its design has been approved by the State Division of Industrial Safety.

Question—How can you identify an approved ROPS?

It carries a plate identifying the manufacturer of the equipment, together with the approval number assigned by the State Division of Industrial Safety.

Question—Must ROPS be installed on old and new farm tractors?

The Safety Order requires ROPS on all new equipment manufactured after July 7, 1972. All farm tractors, new and old, must have ROPS after July 7, 1978.

Question—Are orchard tractors exempt from ROPS?

No. Orchard workers in California lose their lives every year in preventable accidents involving tractors; therefore, ROPS will also be required on orchard tractors manufactured after July 7, 1973.

Question—What about small, lawn-type tractors?

ROPS is not required on tractors with engines of 20 hp or less.

Question—Can an individual design and build his own ROPS?

It's not recommended, because each ROPS design must be engineer-tested to meet industry specifications prior to Division of Industrial Safety approval.

The State Industrial Safety Board has adopted a revised Article 25 of the General Industry Safety Orders, including new requirements for roll-over protection for operators of farm tractors. The revised order became effective February 8. The accompanying article by Michael Divjak explains major features in the safety order as it now affects farm tractors. The fatalities described below amply illustrate the need for the Safety Order.

Between January 1969 and November 1971, six orchard workers lost their lives when their tractors overturned. One accident occurred in 1969, 2 in 1970, and 3 in 1971. The six fatalities are described below.

A 17-year old agricultural worker was helping his foreman fertilize avocado trees. The foreman drove a small tractor with a trailer loaded with bags of fertilizer to various points in the grove and then the two men would distribute the fertilizer by hand. While the foreman was gone, the worker began driving the tractor, although the foreman stated that he had told him not to operate it. Before the employee had gone far, the terrain dropped off sharply. Apparently, he tried to stop but with the steep grade and the weight of the fertilizer in the trailer, the brakes couldn't stop the unit. He continued on for another 75-100 feet to where a low-hanging avocado limb blocked the way. As he made a sharp right turn to avoid the limb, the tractor turned over on its left side, throwing him off. It appeared that the steering wheel had struck the limb, and it is likely that the employee's head also struck the limb as he made the sharp turn and the tractor turned over. It is doubtful that the brakes being slightly out of adjustment was the proximate cause of the accident. It is more likely that the slope was too great for the wheel-type tractor to be driven down, regardless of the condition of the brakes. A canopy guard and a seat belt would probably have minimized the severity of the accident.

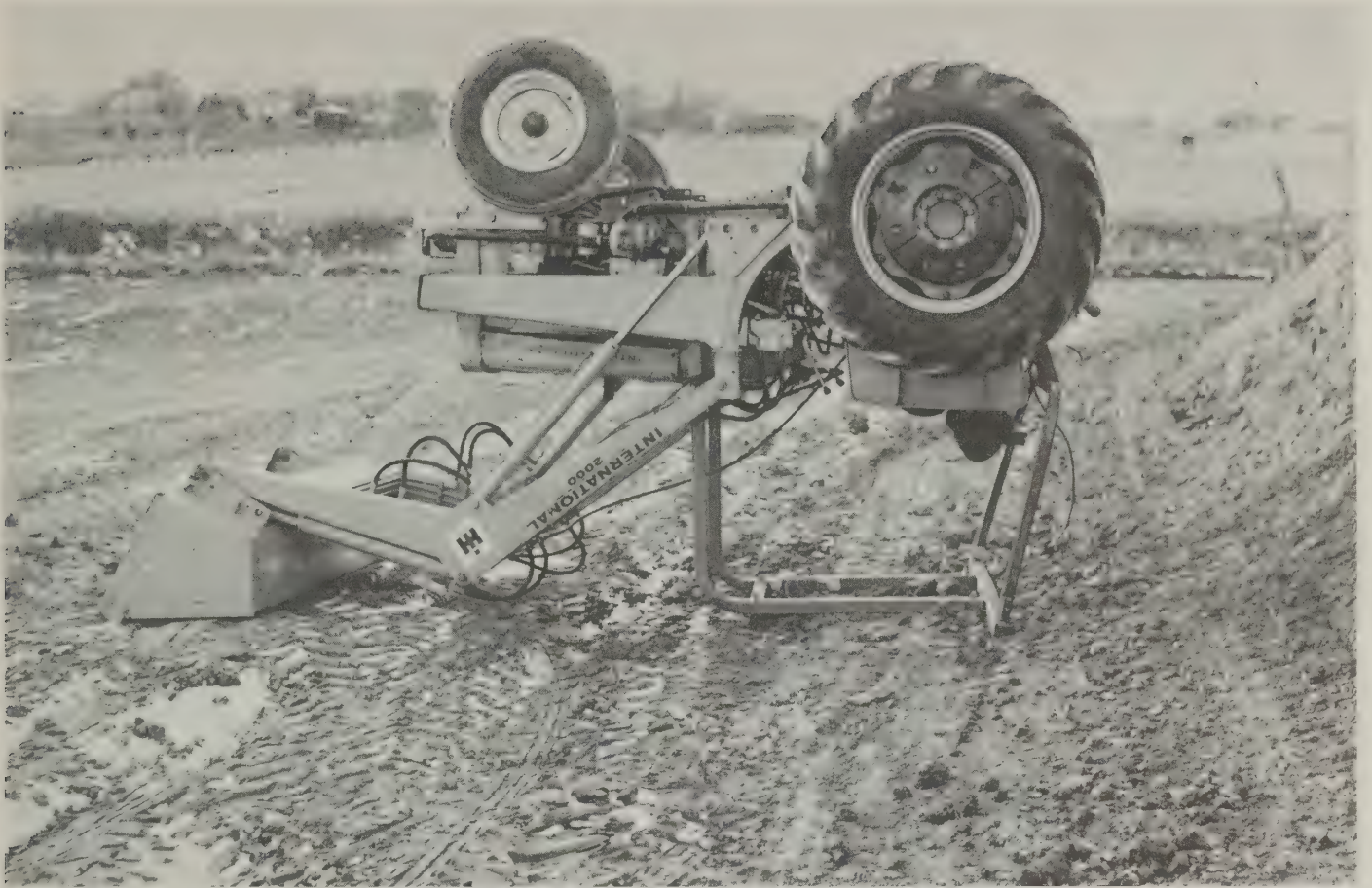
Arrangements for eliminating hazard: Requirement was written to repair or adjust brakes. Foreman claims he has established a new policy of removing key from ignition when parking vehicle to prevent unauthorized use.

*

*

*

A tractor operator was driving a tractor hauling empty crates to an apple orchard and removing full ones to a nearby truck loading area. The edge of the orchard bor-



dered a steep 40-foot embankment with an asphalt road at the bottom. The worker drove too close to the edge of the embankment and the tractor turned over down the hill. He was thrown off and the tractor rolled over his head, landing upright at the bottom of the hill. The operator died as a result of crushing head injuries. An inspection of the tractor after the accident showed the brakes, steering mechanism, and all controls functioning normally. The accident was attributed to probably excessive speed and driving too close to the steep bank. The employee would probably not have been killed if the tractor had been equipped with a seat belt and a safety frame.

Arrangements for eliminating hazard: A letter will be sent to employer recommending seat belts and roll over protection.

* * *

An experienced tractor driver started his tractor while it was in fifth gear. The tractor started to climb a tree, flipped over and fell on the operator, impaling him on the clutch lever.

Arrangements for eliminating hazard: Roll bars and seat belt would have prevented this fatality.

* * *

A 77-year old laborer was operating a tractor with a mower cutting grass and weeds between rows of citrus trees. Apparently the vehicle overbalanced while he was making a turn into a lower level of the orchard, causing it to overturn. He was crushed beneath the tractor and died instantly.

Arrangements for eliminating hazard: Roll bars and seat belt would have prevented the fatality.

* * *

A laborer was pulling a disc cultivator with a small wheel tractor. The worker was supposed to knock down irrigation mounds so that a truck could get into the orchard for peach picking. The ground was wet and the unit stuck in the mud. The employee disconnected the tractor from the cultivator and moved the tractor up to get the wheels out of the ruts. He then tried to free the cultivator by attaching a chain from the tractor to the cultivator at seat level. The chain was attached too high, and when the employee stepped on the gas the tractor flipped over backwards on top of him.

Arrangements for eliminating hazard: Roll bars and seat belt probably would have prevented the fatality.

* * *

As he was fertilizing an olive orchard, a farm worker drive his tractor too close to a four-foot embankment. (The embankment made an angle with the level of approximately 30 degrees.) The left front wheel dropped over the edge. He continued on for a few feet with the front wheel turned sharply to the right in an effort to climb back up the embankment. Then the left rear wheel slipped over the embankment and the tractor rolled over, coming to rest on its back. The worker was pinned beneath the overturned tractor and killed instantly.

Arrangements for preventing hazard: A barrier guard is being erected along the embankment to prevent a vehicle from sliding over the edge.

Focusing on 'Target Industries' means safety

**David M. Valoff, Senior Safety Engineer
State Division of Industrial Safety, and
Team Leader of the Target Industry Program in California**

It's called the Target Industry Program (TIP), and I head up the team of nine safety engineers working on the program in California.

From TIP's beginning on July 1, 1971, the team members and I were both pleased and apprehensive—pleased that we were chosen to represent California in an historically unique State and National Program and proud to be a part of this first Target Industry team. But we were also apprehensive because of the newness of TIP and the controversies surrounding the national Occupational Safety and Health Program (OSHA) of the U.S. Department of Labor.

Being on the TIP team also meant we would contend with new regulations, learn new inspection procedures, and work under a philosophical approach to safety different from our own.

But from the beginning the TIP team won some important support. William C. Hern, Director of the State Department of Industrial Relations, bolstered us with his unqualified backing and assured us that TIP would receive high priority. With this assurance, we went to Washington, D.C. in July for special training in OSHA procedures and regulations. While there we also heard answers to some of our questions about the kind of reception employers might give us in the course of our workplace surveys. We were assured that "Uncle" would take care of his own . . . imprisonment and a \$10,000 fine were the penalties facing anyone who shoots a compliance officer!

Once we had completed our three weeks of basic training under the eyes of the U.S. Department of Labor's OSHA personnel, the TIP team returned to California to begin its inspections. We were supplied a list of 676 firms to be checked out in one fiscal year. Actually, by the time we began, the list was expanded to 786 firms, and we had only ten months remaining to do the job—16 percent more work in 17 percent less time!

However, by February, 1972, we had visited about half of the firms on our list. Eight compliance officers had taken the training in Washington, D.C. with me, but two were held in reserve until February 14 when we brought them in to help us complete the inspections that OSHA expected by June 30.

Some Observations of Note

Contrary to our original expectations, TIP compliance officers on our team have been well received by employers. In fact, many employers have given team members the "Red Carpet" treatment. Generally, treatment has been courteous, and employees of some firms were

even given special instructions on how to comport themselves when the "OSHA OGRE" arrives.

We had also anticipated friction between management and authorized labor representatives, particularly on the walk-around surveys. With both parties tagging along with the OSHA compliance officer, they might be tempted to take pot-shots at one another, with our TIP team man in between. But this has never happened. As a matter of fact, the arrival of an OSHA compliance officer in many cases seems to stimulate close cooperation between management and labor. Sometimes it was apparent that both were anxious to show a united front to the compliance officer.

It also seems apparent to me that OSHA has produced a widespread and positive reaction among management. Many trade associations have spent considerable time and money producing information safety bulletins, checklists of unsafe conditions, as well as other safety materials. Some associations have also begun the practice of alerting all members to citations and penalties assessed by OSHA against individual members—in effect telling each member about the unsafe conditions likely to be cited.

One large corporation sent their national safety director from the East to that firm's plant in California. In a week's time he uncovered about 400 unsafe conditions, and ordered them corrected; when our TIP compliance officer made his walk-around inspection, he found very little to cite.

Conclusions

The mere fact that OSHA exists has had a notable and positive effect, since there seems to be among employers a marked awakening to job safety problems. Members of our TIP team unanimously agree that OSHA has acted as a major stimulus to achieving greater safety in industry. Employers appear to accept OSHA, and many voice their approval of the program.

There are also some negative reactions and objections to OSHA. The most common complaint concerns penalties. Many employers are offended by the automatic penalties—whether or not hazards are immediately corrected, the employer faces a possible fine.

TIP team members also have complaints. In contrast with procedures of the State Division of Industrial Safety, OSHA involves a great deal of paper work which considerably slows down inspection and compliance work. But the TIP team has several weeks remaining before their job is done. With that time and a lot of hard work, we shall inspect the remaining firms on our list and perhaps confirm some of these early impressions of OSHA's effects on industrial safety in California.



California's Target Industry Program team: (front row, l. to r.) George Schlemmer; Alfred Palacios; Emlyn Cox; David Schumaker; (back row, l. to r.) Stanley Merrick; John Chocholak; David Valoff (team leader); Henry Grant; Troy Crews.

The Target Industry Program, directed in California by the Division of Industrial Safety, is part of the nationwide effort of the U.S. Department of Labor to prevent workplace accidents and injuries. The program concentrates on high-hazard industries and those with very high rates of injury to workers. The four industries in California receiving special help under TIP are meat products, roofing and sheet metal, mobile homes and miscellaneous transportation equipment, and lumber and wood products. The State has about 840 places of employment in these four industries, and about 70,000 workers. A special eight-man team of

safety compliance officers was organized under the leadership of David M. Valoff, senior safety engineer in the Fresno office of the Division of Industrial Safety. Before the end of June, that team will visit every one of the 840 places of employment in the four TIP industries, make walk-through inspections, and seek to correct safety violations, under national work safety standards adopted by the U.S. Department of Labor. The accompanying article by Valoff reviews the team's experiences and evaluates some early impressions of the effectiveness of the new Occupational Safety and Health law.

She made safety programs click by work and care

Sharon V. Adams
Administrator—Safety, Health, and Benefits
General Electric Co., Aviation Service Operation/Ontario

1967 was the year I was hired and General Electric's first year to have a nurse at the Aviation Service Operation/Ontario. By the end of August of that year there had been more than 15 lost-time accidents.

Part of my nursing duties required taking the history of the accident. In doing so, I found that almost all of the injuries could have been prevented. Periodic safety audits were being performed but obviously were ineffective because the injuries continued.

To my way of thinking, being a good nurse after the injury was not good enough when, with a little effort, the injury could have been avoided and the man spared the injury. (That's my idea of preventive medicine.)

With support from my boss and the plant manager, I established a safety committee program as outlined by the California Inspection Rating Bureau. The workman's safety committee was the first in GE's Aircraft Engine Group that was not required by a union contract. It has been an interesting experience and certainly has produced satisfactory results. When we perform safety audits, the instructions are to write each and every complaint received. These are reviewed with the audit findings, and alternative solutions are studied.

Once a course of action is determined, then the man on the floor is informed (usually by the one who received the complaint) as to the plan of action or decision. In this way, the man on the floor knows someone will listen to him, values his opinion, and corrects the situation or explains the reason for no action. I feel that this approach actively involves more people in the safety program, highlights safety problems which might otherwise have been overlooked, and builds a constructive safety attitude.

One of my first safety campaigns dealt with safety glasses. People were suffering eye injuries but would not wear their safety glasses because they slipped, were uncomfortable, and the attitude toward them was poor. I searched for and found an adjustable safety glass which was purchased for the whole facility even though they were more expensive than the ones previously used. I fitted each pair issued. The result is excellent, and employee attitudes toward safety glasses have generally improved.

Housekeeping is a nit-picking thing but it can pay off. Our facility is 2,000 percent safer today than it was in 1967, and one reason is improved housekeeping.

Fire is one of our high potential hazards here. To reduce the hazard we hold fire training sessions, are establishing fire drills, and are scrutinizing the handling and storage of flammable liquids and other combustibles.

Any safety program is multi-phasic. To me the most important phase, and the one that has produced the most results, is that someone cares.



Sharon V. Adams, one of the few women in the United States directing a work safety program, has more than fulfilled her goals to succeed in what traditionally may be considered a man's technical engineering field. The safety program she has developed and administered made possible a 10 percent reduction in Workmen's Compensation premium rates for her company; set a National Safety Council record of more than 3.5 million manhours without a lost-time accident; and won for herself a managerial award. Her recognized excellence also won her election to the Los Angeles chapter of the American Society of Safety Engineers.

But use methyl chloroform with care

Max Bart, Industrial Hygiene Engineer
Environmental Engineering, State Division of Industrial Safety

Methyl chloroform (1, 1, 1-trichloroethane) is commonly assumed to be one of the safest halogenated hydrocarbons in industrial use. During the past 20 years or so it has achieved popularity as a "safe" substitute for the more toxic halogenated hydrocarbons, such as trichloroethylene, perchloroethylene, and especially carbon tetrachloride. Methyl chloroform has a threshold limit value of 350 ppm. This is the airborne concentration to which nearly all workers may be repeatedly exposed day after day without expectation of illness or injury. The TLV is based upon experimentation involving animal and human subjects, which showed that exposures of that order of magnitude had no harmful effect.¹

However, a note of caution must be sounded about this solvent. There have been reports of eleven accidental deaths resulting from improper use of methyl chloroform since 1958. These tragedies occurred when workers used the solvent in unventilated tanks and compartments, and it is thought that the airborne vapor concentrations in several cases may have reached levels of the order of 50,000 ppm. Analyzing one of these accidents, Hatfield² stated that workers in a particular shop had assumed that the new material would not be dangerous since it had been substituted for a more toxic material. Although containers of the solvent were plainly marked with the warning label, "Use with adequate ventilation," this was largely ignored because it had been used for several years without mishap. In reviewing methyl chloroform poisoning cases in the records of the Armed Forces Institute of Pathology, Stahl³ said, "Most of the reported deaths . . . have been found in closed spaces. The dangers of working with this in a closed environment have not been sufficiently publicized. It must be stressed that the knowledge of its toxicity should not lead to carelessness in dealing with it, and great caution should be exercised while using it in unventilated space."

There is no question that the use of methyl chloroform can be safe when appropriate precautionary measures are taken, and when airborne vapor concentrations are kept at or close to the TLV. Stewart, et al.⁴ have shown that human subjects experimentally exposed to 500 ppm of the solvent vapor for periods of 6½ to 7 hours per day for 5 days suffered no adverse effect.

Nevertheless, the accident case histories cited above indicate that there is a critical need for increasing the level of respect for this solvent on the part of workers. It is strongly recommended that all persons handling methyl chloroform be made aware that the vapor of methyl chloroform is *not* harmless when present in high con-

1,1,1-TRICHLOROETHANE (METHYL CHLOROFORM)

CAUTION!

Use with adequate ventilation.
Avoid prolonged or repeated breathing of vapor.
Avoid prolonged or repeated contact with skin.
Do not take internally.

centrations, and that the solvent must be used with adequate ventilation. Under no circumstances should employees be permitted or encouraged to use it in poorly ventilated or unventilated compartments, rooms, drums, or tanks.

It should also be noted that methyl chloroform vapors, like those of any chlorinated hydrocarbon, can be decomposed by contact with hot metal surfaces to give irritating concentrations of gases, which may include hydrochloric acid, chlorine, and phosgene. This can occur, for example, in areas where gas or arc welding is carried out in the neighborhood of a vapor degreaser. In particular, ultraviolet radiation, as produced by arc lamps and by gas-shielded arc welding processes, can interact with extremely low airborne concentrations of chlorinated hydrocarbon vapors (in the range of a few parts per million) to give measurable concentrations of hydrochloric acid and phosgene^{5, 6}. For these reasons, one should always be on guard against the possibility that vapors of methyl chloroform, or of trichloroethylene, or perchloroethylene, being emitted by degreasers or by any liquid solvent source, can yield severely irritating and, potentially, highly dangerous gases.

¹ Threshold Limit Values of Airborne Contaminants, adopted by American Conference of Governmental Industrial Hygienists, 1970.

² Hatfield, T. R., Col, et al., A Fatal Methyl Chloroform (Trichloroethane) Poisoning, Arch. Environ. Health, 20 (2), 279-281, Feb. 1970.

³ Stahl, C. J., CDR, MC, USN, et al., J. Forensic Sci., 14 (3), 393-396, July 1969.

⁴ Stewart, R. D., MD, et al., Experimental Human Exposure to Methyl Chloroform vapor, Arch. Environ. Health, 19 (4), 467-472, Oct. 1969.

⁵ Patty, F. A., editor, INDUSTRIAL HYGIENE AND TOXICOLOGY, 2nd rev. ed., Vol. 2, 1963 p. 2305.

⁶ 1, 1, 1-Trichloroethane (methyl chloroform), HYGIENIC GUIDE SERIES, American Industrial Hygiene Assoc., Rev. 1961.

Workers protected by DIS safety orders

**Clifford W. Farmer, Supervising Engineer
Construction Section, State Division of Industrial Safety**

The Division of Industrial Safety is one of the divisions in the California Department of Industrial Relations. Concern for the welfare of workers led to California's enactment of laws as early as 1914 to ensure safety in places of employment. These laws have been administered by the Division of Industrial Safety since 1945, when it was created as a part of the Department of Industrial Relations. For more than a quarter of a century, the division has had jurisdiction over on-the-job safety with broad powers to assure Californians that their work places are safe.

To provide the best service possible to the people of California, the division's activities are largely decentralized with 19 offices throughout the state with the headquarters in San Francisco. The work of the division is conducted chiefly through seven operating sections—construction, electrical, elevator, industrial, pressure vessel, research and education, and the environmental engineering unit. The division engineers are constantly inspecting work places to make sure they are in compliance with safety orders.

The legal authority for the Division of Industrial Safety is derived from the state constitution and the state labor code, and it reflects California's deep concern for the welfare of its workers. The concern is clearly expressed in Section 21, Article XX of the state constitution, which requires full provision for securing safety in places of employment. Some of the responsibility of the division, among other things, is to enforce all laws or lawful orders requiring work and workplaces to be safe, to investigate disabling or fatal industrial injuries, to check whether workplaces are safe, to prepare safety orders (standards of industrial safety) which if approved by the Industrial Safety Board have the force and effect of law, to establish special orders to cover a specific individual place of employment or process of work if considered unsafe, and to examine, test, and approve (or disapprove) certain types of equipment if approvals are required by the safety orders or statutes before such equipment may be used.

History of Developing Safety Orders

California's Safety Orders stem from the concern of the state legislators for the welfare of its workers. The legislators declare that it is the employer's duty to maintain a safe place of employment by whatever means are available and "to do every other thing reasonably necessary" to make a place of employment safe. In some states, safety codes are still written exclusively by the respective legislators. This is a cumbersome and very difficult process. In California, we do not have to wait for sessions of the legislature, as the authority and responsi-

bility was given to the division to write safety orders, which require the approval of the Industrial Safety Board before becoming effective.

When the need of new safety orders is established, when a revised one is necessary where new methods and processes introduce hazards not covered by existing orders, or when new technology indicates safer ways to perform work assignments, the division assigns the job of drafting them to staff members who are well qualified in the particular field to be covered. Much research and study is done before the proposed safety orders are put onto paper in even a rough or preliminary form.

When the first draft of the proposed safety orders is completed, it is printed and presented by the division at committee meetings of interested groups. The opinions from the members of this working committee are invited and noted. Every detail is reviewed and every problem is thoroughly discussed. There is much give and take, and much effort is given to ironing out conflicting views, while at the same time adhering to one purpose: "full provision for securing safety in places of employment."

When the proposed safety orders are finalized, plans are made for a public hearing before the Industrial Safety Board, where any person is welcome. At the public hearing, full and free discussion is solicited. A word-for-word record of the proceedings is taped. The comments are studied and reviewed by the division's staff engineers, and those comments considered of merit are incorporated into a revised draft of the proposed safety orders which are then submitted to the Industrial Safety Board. If the board by majority vote adopts them, a copy of the safety orders (as adopted) is sent to each person who is on record as having attended the public hearing or who commented in writing at any stage of the preparation of the orders.

Following the board's adoption of these safety orders, anyone may within 20 days formally petition for a rehearing on any specific part or parts of the safety orders. If formal petitions for a rehearing are filed, the board reviews them and grants or denies them. If petitions are granted, another public hearing is scheduled, and the hearing is limited to the part or parts of the safety orders covered in the petition. If no formal petition for a rehearing is made within 20 days, the board files the safety orders with the California secretary of state as soon as the Building Standards Commission checks that there is no conflict, duplication, or overlapping with other state regulations applying to buildings. Then the order or orders become automatically effective 30 days after filing.

The democratic nature of the practice of developing California's industrial safety orders has proved to be very effective, and it assures everyone who is affected or interested an opportunity to voice his thoughts and opinions on all or any part of the orders being considered.



A Roll-Over Protective Structure being tested.

The mere approval of the orders does not end the division's work in any respect. Meetings are held in various sections of the state, with the division explaining and discussing the orders with employers and workers. Nothing is left undone to place accident prevention on an even sounder basis to make "full provision for securing safety in places of employment."

Development of Safety Standard for Roll-Over Protective Structures

Roll-over protective devices and canopies have been required for many years for the protection of operators of heavy equipment in the logging industry. The construction industry was presented with this problem in the late 1950s and in the early 1960s. They requested the division to investigate and develop a roll-over protective structure (ROPS) safety standard for scrapers. In 1965, the division called for ROPS for this type of equipment in the Construction Safety Orders.

This was a progressive idea in the field of construction, and it was expected that, since it was a more progressive regulation, there may be need for further

changes in order to adjust to the unforeseen situations. Such was the case for our regulations requiring roll-over protection on construction scrapers.

From 1965-1970, the division thoroughly studied what type of safety orders should be written to control this hazard and yet would be reasonable and effective. Many committee meetings were held by the division with SAE, the contractors, the labor leaders, the insurance representatives, and other professional engineers in preparing the preliminary draft. This was not an easy task, as many of the members of this working committee came from out of the state, and thus many of the ideas were exchanged in correspondence between the meetings.

Once the draft was completed, the division presented it to the Industrial Safety Board at their public hearing. The safety standards for ROPS and seat belts were approved by the board in September 1970 and became effective law on Nov. 2, 1970, and read as follows:

"1596. Roll-Over Protective Structures (ROPS).
(a) ROPS, approved by the division, and seat belts shall be provided on all scrapers, crawler tractors, front-end

loaders, bulldozers, and motor graders manufactured and placed into service after April 1, 1971, and having brake horsepower ratings above 25. The ROPS must also give reasonable operator protection against falling or rolling objects. Older scrapers first placed into service after August 8, 1966, having a capacity of 15 yards or more (struck capacity) and a design speed above 15 mph must also have similar protection, as do any wheel-type front-end loaders within the same age bracket which operate on other than level ground and are of 1½ yards or larger capacity. This order does not apply to side-boom pipe laying tractors.

(b) Approval. Existing ROPS approvals, any of which may be revoked for cause, will normally remain effective but only for the specified construction equipment manufactured prior to April 1, 1971. Any ROPS to be installed on equipment manufactured after April 1, 1971, must have a new or newly extended approval evaluated upon ROPS compliance with criteria identical or equivalent to the appropriate SAE Recommended Practice among those numbered J320a, July 1969; J394, July 1969; J395, July 1969; and J396, July 1969; as certified by the manufacturer of the vehicle involved, an independent testing laboratory, or a registered professional engineer. The division may accept other bases for approval, such as actual roll tests verified by movie film and records, that are certified by one of three sources specified in the preceding sentence as meeting or exceeding the SAE provisions.

(c) Seat Belts. Seat belts shall be adequate for the intended service and in good repair. Belts previously approved by the division and installed prior to January 1, 1971, are acceptable as long as they remain fit for service. Belts installed after January 1, 1971, must meet the following requirements which parallel those of the SAE Recommended Practice J386, March 1969, to the extent that most provisions of J386 and the applicable provisions of J4c will be complied with throughout California on construction projects."

The requirements included the adjustment, marking, stiffness, material, release, closure, location, operation, and tests. The only major change made was in the webbing. The recommended SAE 1.8 in. width was increased to a full 3 in. width.

The division is hopeful that other regulatory bodies will adopt criteria similar to the above standards and set reasonable dates for compliance, in the interest of obtaining uniformity from coast to coast as to roll-bar acceptability.

Engineering Analysis of Safety Problem Involving Earthmoving Equipment

The fact that contractors operate their earthmoving equipment throughout the United States makes it advantageous to have a standard that would be acceptable to all concerned, regardless of the geographical location.

The division made an analysis of the design criteria proposed by SAE, as well as other proposals to develop standards for ROPS. It was determined that the SAE standards were the most acceptable. Under this system, the canopy identical in design to that proposed for widespread use on a particular piece of equipment would be subjected to a laboratory test calling for the application through hydraulic jacks of certain forces vertically and horizontally against the upper canopy members. If the

canopy or protective unit was able to absorb the energy applied by these hydraulic jacks without entering into the operator's safety zone (referred to as the critical zone), the design would be accepted.

In the meantime, many individual roll-over protective devices designed by professional engineers have been approved by the division and installed on California construction equipment. It is probable that the roll-over protective units now in use are not as good as might be obtained by following more carefully developed standards such as proposed by SAE, but the results have been satisfactory.

Educational Process Developed to Make New ROPS Safety Standard Effective

To ensure that the safety order requiring ROPS for construction equipment was understood by the contractors as well as the operators, the division engineers throughout the state discussed the intent of the order with the contractors and operators in their territories. The division also held meetings with the contractor and labor organizations state-wide and presented to them how we planned to make the enforcement of this order effective. Our engineers helped the contractors to develop reasonable schedules for installing ROPS on their equipment. Also, safe locations where equipment could operate until ROPS could be installed was discussed between our engineers and the contractors on an individual basis at their construction sites.

Enforcement of New ROPS Safety Standard

The division developed a reasonable but effective enforcement procedure for this order. This safety order became effective Nov. 2, 1970. Within this order, the date of April 1, 1971 was established to require ROPS for all new equipment manufactured and placed into service after that date. This allowed the division's engineers approximately six months to concentrate on the existing equipment presently operating in the State of California. They inspected the heavy earthmoving equipment at construction sites within their territories and set realistic dates for the installation of ROPS to the individual contractors. Then the contractors took immediate steps to install ROPS on their equipment. Very few construction operations have been closed down for lack of compliance with these standards, as the contractors have taken the initiative to meet the challenge prior to the effective dates.

Conclusion

The division has made a survey of the heavy earthmoving equipment operating in the State of California over the past few months to determine approximately where the construction industry stands regarding the total amount of ROPS that have been installed on this equipment. Our survey indicated that better than 80 percent of this equipment has ROPS on it to date, and we expect the remainder to be completed within 12 months.

As this safety hazard is being eliminated, the division is presently studying and gathering material for the environmental control for the operator's working area. Consideration will be given to reducing noise, heat, dust, and fumes.

California is looking forward to rapid expansion in controlling these hazards and developing a safe atmosphere for the operators of this equipment.

These deaths need not have happened

The Accident and Death	The Unsafe Act	The Unsafe Condition	To Prevent Such Deaths
For an unknown reason a molding press tender put his head in the machine, between the dies. The operator, on the other side, started the machine in operation. The tender was killed.	Placing of head between dies.	Unguarded opening. Microswitch rendered inoperative.	Keep guards on machine. Don't tamper with safety devices.
An employee of a bowling alley refinishing company was burned to death when flammable liquids exploded while being applied to the lanes.	Using flammable liquids within range of ignition sources.	Sparking motors in work area.	Use adequate ventilation; shut down ignition sources; provide escape exits.
A farm laborer was filling smudge pots when one of the pots overflowed and caught fire. The laborer was burned to death.	Filling smudge pots by hand. Oily clothing.	Fire flickering in pot. No fire extinguisher.	Provide fire extinguisher. Use safety cans if oil has to be carried.
Steps were being welded on a 3200 gallon aqua ammonia tank that had not been vented after use. It blew up, killing the welder.	Welding on an unvented tank.	Flammable ammonia vapors in tank.	Purge, flush out, and vent any ammonia tank that is to be welded.
A maintenance mechanic died from hip and leg injuries when he was caught between a conveyor belt and a chute lip. The conveyor belt was started by another employee who did not know the victim was on the belt.	Working on a "live" conveyor belt.	Operating switch not locked out.	All switches on conveyor belts should be locked out before working on belt.
A set-up man in a machine shop was killed when a lathe chuck broke off and hit him in the head as he was adjusting the lathe.	Overspeeding machine.	Machine can overspeed due to control set-up.	Arrange two-speed control so it cannot be operated externally.
A warehouse laborer while going to remove a solid plate over a grain auger at floor level stepped through a grille and amputated his leg. He died of shock.	Walking on grain-covered grille.	Too large an opening in grille.	Keep all grille openings over auger no larger than two inches.
A farm laborer was operating a small type tractor. Trying to turn around, he backed over a bank. Tractor over-turned backwards, killing him.	Working too close to ditch edge.	No roll-over protection on tractor.	All agricultural tractors should have roll bars and seat belts.
A ranch hand was loading irrigation pipe onto a trailer. He raised pipe into a 12 KV line and was electrocuted.	Raising irrigation pipe under high-voltage line.	Storing pipe under high-voltage line.	Plan in advance to store pipe away from high-voltage line.
A 16 year old boy was cleaning out a silo when he was sucked under the grain and suffocated.	Working alone without a safety line.	Screw conveyor running, causing grain to move.	Mechanical means should be installed to empty silo.
A company official entered a closed tank that had been filled with nitrogen to retard oxidation. He was asphyxiated.	Entering a lethal atmosphere.	Tank filled with nitrogen.	All confined spaces should be tested for oxygen deficiency before entering.

This is a partial list of the most recent "Tailgate Topics" published for free distribution by the State Division of Industrial Safety. They are available from any statewide office of the Division, or by writing to DIS headquarters, Box 603, San Francisco, CA 94101.

STEPPING SAFELY

What to do to prevent slips and falls which account for a large number of industrial (and home) accidents. Ways to cover floors, or treat them, keeping them clean and dry, with orderly passageways, are given.

SUPERVISORS: CHECK YOUR SAFETY ATTITUDES

Supervisors should check up on themselves—just as they do on the men whose safety is entrusted to them. Here's a self-check test of 14 points.

FOR HANDS' SAKE

Just to remind you what a marvelous, versatile "tool" your hand is. There's nothing to replace it. But there are ways of protecting your hands.

FORKLIFT TRUCKS—THE BEAST IN THE WORKPLACE

Used properly, they're the workhorse of industry, but used negligently, they're a dangerous beast. Work accidents involving forklifts have soared alarmingly. Refresh your operating knowledge with this Topic.

SAFE AIR FOR FIREFIGHTERS

Tells about self-contained breathing packs for hazardous atmospheres (created by certain fires or in some confined

spaces); how to refill them; how to check them; and how to tell if improperly refilled.

HEAR THIS DANGER

Are you indifferent to potentially harmful noise in your workplace? Many are—until it's too late. Here are some symptoms to alert you; also what employers must do.

GIVE BACKS A LIFT

Rules for proper lifting: correct position, how to hold the load, how to move with it, how to set it down. This is something everybody should know.

BEWARE OF BATTERY HAZARDS

Yes, batteries are hazardous and this Topic tells why. Also how to control the hazards, especially when using jumper cables to start a vehicle.

Special Safety Topics

"Controlling Noise—Revised Standards for California Workplaces" is about hearing conservation. How to make noise surveys; what are allowable exposures; what about impact or impulsive noise—about engineering controls—personal protective equipment? Answers are in these four pages.

"Meat Industry"—a bulletin that explains how to obtain "Job Safety Confidence" in this hazardous industry. Tells where and how injuries occur and gives steps to minimize injuries by following rules for use of machines and knives.

Elevator safety codes silent on quake hazards

**Raymond J. Rodriguez, Supervising Engineer
Elevator Section, State Division of Industrial Safety**

Safe operation of elevators is no accident. The elevator's enviable record as a safe means of transportation today has evolved from strict standards for design and installation, and from strict enforcement of such standards.

But no elevator can be any safer than the building in which it is installed. And no building can be any safer than it is structurally designed to be.

The San Fernando earthquake of February 9, 1971 reminded the whole elevator industry of the problem that has remained unsolved until this time: Strong-earth movement during an earthquake affects a building and the component installations in that building.

Why design elevators to withstand a certain magnitude of strong-earth movement, if the building in which the elevator is installed is not designed to withstand a comparable force? Furthermore, if elevators were designed as "earthquake resistant", or "earthquake safe", what might the criteria be for such a level of safety?

All elevator safety codes now in force in the United States, including the California Elevator Safety Orders, are silent on this problem. This is perhaps so because the problem seemed insoluble, and the industry and the public seemed resigned to accept equipment losses, in-



(Above) Elevator car counterweights were forced out of their guide rails, causing extensive damage to the top of the car. (Right) This interior damage to the roof of an elevator car was caused when the counterweights, out of their guide rails, struck the car's top and enclosure.



juries, and deaths as a result of earthquakes. Until San Fernando, that is. For when the earth moved at 6:01 in the morning of that February 9, the elevator industry technicians and safety engineers of the State Division of Industrial Safety moved quickly to survey the damage and make repairs. They found more than 1,000 of the 9,000 elevator, escalator and dumbwaiter installations in Los Angeles County damaged in some way. Most serious damage was to the cars and the counterweights. Nearly 700 counterweights were thrown out of guide rails, and more than 100 of these damaged cars. (See the table, Summary of Damage in the Los Angeles Basin to Elevators, Dumbwaiters, and Escalators, February 9, 1971.)

In view of the extent of the damage, who knows how many passengers might have been injured if the earthquake had occurred at a later and busier hour?

That is the potential threat that prompted me to ask cooperation of the elevator industry in assessing damage to their equipment. And the information in the accompanying table showing damage could not have been gathered without industry cooperation. Then I asked representatives of all elevator companies and others in the industry to meet on September 15, 1971 in Los Angeles where preliminary discussions were held on the factors to be considered before an earthquake safety standard protecting elevators could be written.

Out of that meeting came the pertinent questions that must be answered. For example, there was general agreement that all non-structural components in a building should be designed to withstand forces that the building is designed to withstand. If so, then elevator designers must consult with structural engineers to learn what earthquake factors are considered in a particular building design. We know that records of strong-earth movement and their effects on structures are an important factor; and we also know that a large number of these records for the first time are available from the San Fernando earthquake. The data was recorded on instruments placed at ground level, mid-level, and at the top of all buildings six floors or higher. To illustrate the importance of this data, instruments in a building at Glendale, about 19 miles from the epicenter of the earthquake, recorded movement of .24 G.s at ground level and movement of .64 G.s at the eighth floor. This magnification of movement from ground level to the top is the so-called whipping motion generated in tall buildings during an earthquake.

In the past, structural engineers have mainly taken into account movement at ground level, and their designs did not entirely compensate for the effects of whipping motion on a structure's equipment and components like elevators. Dynamic analysis of movement throughout a structure can assist in the design of safer buildings and safer components—and help us find a remedy for counterweights leaving their guide rails, and other movement of equipment caused by the lateral, whipping motion of a building.

I have indicated only some important factors in the problem of designing elevator installations to withstand movement of buildings during earthquakes. The problem is complex. No one in the industry minimizes the complexity or the urgency requiring a solution. A committee of 15 experts, representing elevator companies, design consultants and government agencies, has agreed to work with me on the problem, and we will coordinate our activities with a national committee which has been formed by the American National Standards Institute A17.1 National Elevator Safety Code Committee. This committee will take the recommendations that came out

of the industry meeting in Los Angeles last September 15 and seek answers to the questions raised by those recommendations.

Summary of Recommendations

1. Make main rail brackets and counterweight rail brackets stronger.
2. Use heavier than 8-lb. counterweight rails.
3. Use spreader brackets to reduce rail deflections.
4. Provide bridging members to tie counterweight rails together.
5. Install auxiliary solid shoe plates to back up roller guide shoes.
6. Guard brackets and equipment in the hoistway to prevent snags of compensating, governor, and trail cables.
7. Restrain motor generator sets against movement or overturn.
8. Securely fasten equipment including machines, controller and selector panels.
9. Provide a sensing device to stop an elevator car if the car's counterweight leaves its rails.
10. Provide a seismic switch to limit, in some manner, the operation of an elevator or bank of elevators during an earthquake.
11. Provide a tie-down mechanism for compensators or a switch to sense movement up or down.
12. Provide governor tail sheave restraint.
13. Provide car top protection against falling material in the hatch.
14. Provide a safety switch to stop the car in the event of a safety set not initiated by a governor activation.
15. Provide ANSI A17.1 code requirement for lighting and communication.
16. Provide cable guards to prevent derailment of cables on all sheaves.
17. Design elevators to withstand seismic acceleration force of from 0.4 G. to 3.0 G. Most buildings are now designed for 0.2 G. (G. is a measure of the gravitational forces exerted on a body under acceleration.)
18. Provide a means to allow operation and inspection of an elevator by qualified personnel after an earthquake prior to restoring it to service.
19. Establish standards by which all elevator companies would be governed in design and construction of elevators, relative to earthquake forces.
20. Design elevators to withstand forces compatible with the forces which the building is designed to withstand, relative to earthquake forces.

It seems clear that the above recommendations, if implemented, can contain the problem of damaging movement of fixed elevator installations during earthquakes. In particular, some solution must be found to design equipment that can resist, within a tolerable margin, the lateral movements caused by strong-earth movements. Hopefully, these recommendations can be incorporated into revised Elevator Safety Orders that can protect equipment and save lives.

**Summary of Damage in the Los Angeles Basin to
Elevators, Dumbwaiters, and Escalators, February 9, 1971**

ELEVATORS

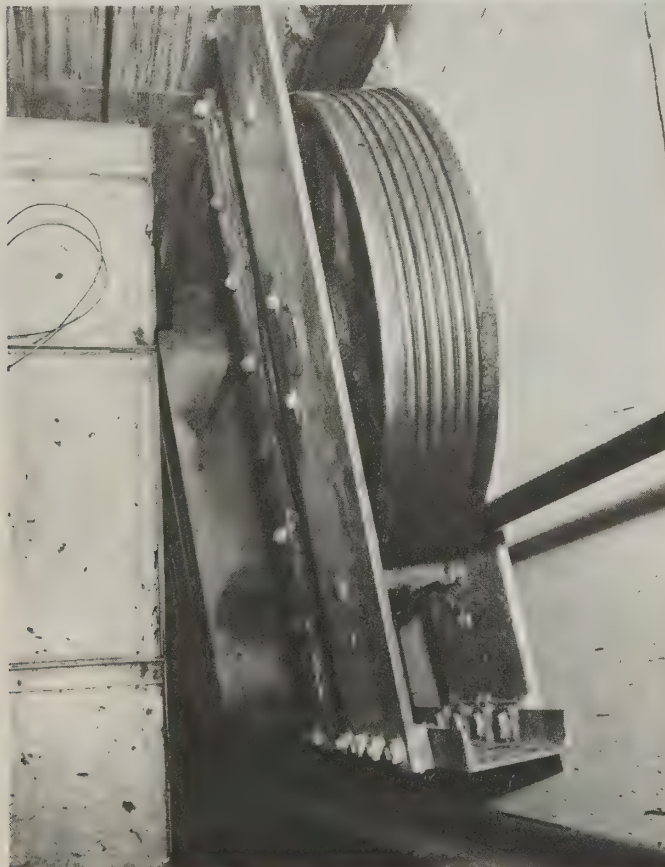
Buffers (stinger damaged, guides damaged).....	2
Cables, Compensating (out of grooves or damaged)	100
Cables, Governor (hung up, cut)	20
Cables, Hoisting (damaged, jumped deflect or sheave)	7 sets
Cables, Traveling (hung up or broken)	7
Cars (out of guides, out of alignment)	18
Cars (steady rest loose)	102
Controllers (moved or damaged)	5
Counterweights (out of guide rails)	674
Counterweights (out of guide rails, damaged cars)	109
Electrical Power Problems	4
Electrical (conduit loose)	5
Generators, Moved (some damaged armatures) ..	174
Generators (burned out)	5
Guide Rails, Car (limits not operable, doors won't work)	7
Guide Rails, CWT. (out alignment, bent or broken)	49
Guide Rails, WT. (brackets broken or damaged)	174
Hoistway Doors (off tracks, gibs out of sill, dragging, out of alignment)	22
Hoistway Doors (glass damage)	2
Hoistway Walls (bowed and hitting car)	2
Hoistway Walls (severe cracks, loose plaster, holes)	50+
Hydraulic (leaks in casing, plunger rubbing, re-aligned)	8
Hydraulic (oil out of tank, tank moved)	3
Interlocks and Car Gate Contact (loose, broken) ..	19
Leveling Units (damaged)	12
Machine Room (floor plates broken, buckled)	1
Miscellaneous (annunciators off, brake rods out of core, light fixtures, broken selector tapes, fuse blowing, door operator)	83
Motor, Hoisting (burned out, out of alignment, slipped rings)	13
Pits Flooded (broken pipes, etc.)	7
Pump Units (moved, reset leaks)	1
Roller Guides, CWT. (broken or loose)	286
Safeties Set	22
Selector (turned over)	1
Sheaves, Drive (broken or cracked)	3
Sheaves, CWT. (broke loose, weight in pit, moved)	2
Shoes, Guide (broken)	9
Victaulic Fitting (replaced)	1

DUMBWAITERS

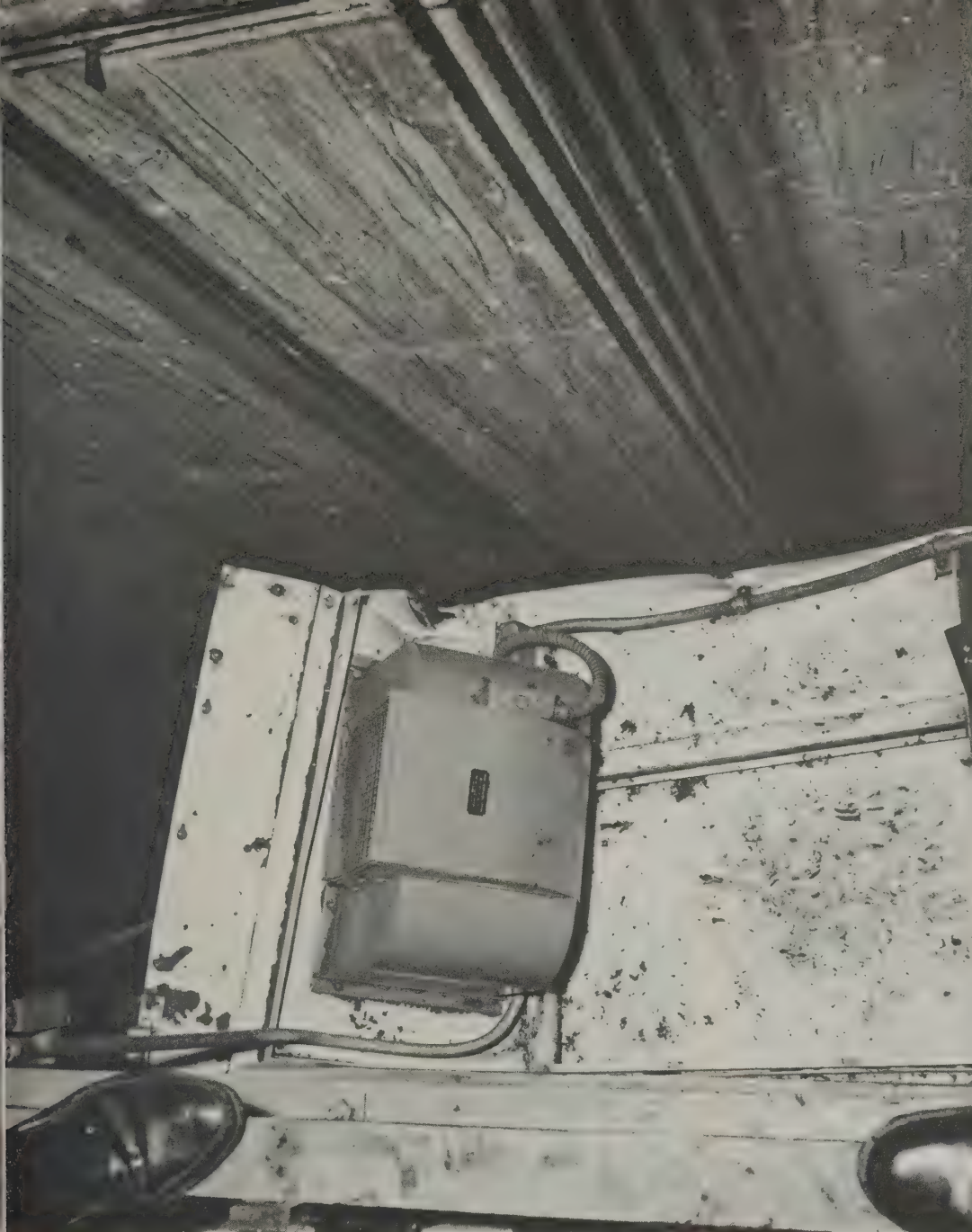
Cables (off drum)	1
Counterweights (out of rails)	3

ESCALATORS

Conduit (pulled out)	1
Governor Chain (off)	1
Switches (skirt switches tripped, skirts spread) ..	5
Truss Bolts (sheared off)	est. 5



(Top) The elevator car counterweights were thrown out of their guide rails and against the hoistway wall. (Bottom) A broken roller guide caused this counterweight to move out of its guide-rails and strike the elevator car.



This elevator car roof was damaged when the counterweight struck it. Note the missing guide rail bracket.

Here is a partial list of more than 50 bulletins, placards, and special brochures on industrial safety and health topics published by the State Division of Industrial Safety. They are distributed free upon request to any statewide office of the Division, or by writing to DIS headquarters, Box 603, San Francisco, CA 94101.

Construction

- S-146 "Safety in Pipeline Construction" tells how to plan and organize a pipeline job so that it's safe.
- S-158 "Protection of Workmen in Trenches" describes measures to reduce trench cave-ins.

Electrical

- S-140 "Keep AWAY from Power Lines!" is about the hazards of overhead electric power lines.

Hazardous Substances

- S-103 "Safe Handling of LP Gas" gives the use and characteristics of LP gas and rules for safe handling.
- S-125 "Are You Using Carbon Tet?" deals with a hazardous chemical.

- S-127 "Look Out for Yourself When You Are Around Crop Spraying" is directed to farm workers.

- S-142 "Live With the Label" gives the rules for labeling toxic materials.

Industrial and Manufacturing

- S-137 "Skin Trouble Is Plenty Trouble" deals with the most common disease you can get at work.

Tools, Power and Hand

- S-117 "Stop Grinding Out Injuries!" describes abrasive wheel precautions.
- S-122 "Handy Rules for Hand Tools" describes proper care and use of many common tools.
- S-141 "Power Hand Saw Safety" gives causes of power hand saw injuries.

Placards

- S-617 "Wear Goggles—You Can Get Used to Goggles—But Never a Glass Eye".
- S-801 "The ABCs of Safety" give a new use for the alphabet—to remind you to work safely.



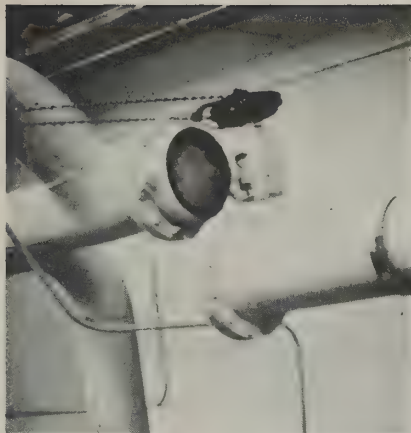
The central heating room at Olive View Hospital photographed only hours after the earthquake.



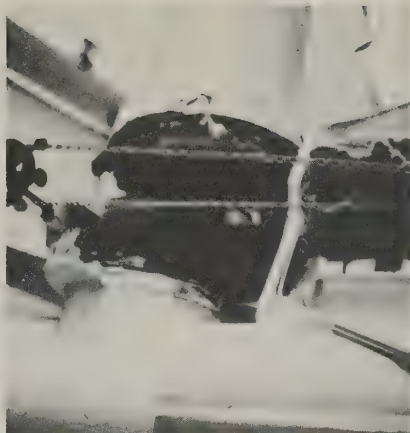
The control panels for the boilers at Olive View were tilted and displaced by the force of the earthquake.



This view of the rear of the boiler at Olive View shows it shifted at least four feet. The boiler was not bolted down.



The cast iron material of this valve was too brittle to withstand movement due to the earthquake.



The movement of these pipes snapped the cast iron body of the valve.



This brittle, cast iron fitting was snapped by the movement of the tank.

The Lesson of San Fernando II

Pressure vessels, piping withstood quake

**Arthur I. Snyder, Supervising Engineer
Pressure Vessel Section, Division of Industrial Safety**

An earthquake having a magnitude of 6.6 on the Richter Scale occurred in southern California on February 9, 1971. The epicenter of the quake was determined to have been just outside San Fernando located in the northeast sector of the city of Los Angeles.

Shortly after the earthquake, field engineers of the State Division of Industrial Safety and other certified boiler and pressure vessel inspectors were requested to collect information on earthquake damage, particularly damage to mechanical equipment.

I am happy to report there were no catastrophic failures of pressure vessels and piping, and very little damage to mechanical equipment was reported. This may be due to the fact that the earthquake occurred in an area mainly residential. The only major industrial facility there using large boilers is the Valley Steam Plant of the Los Angeles Department of Water and Power, located about nine miles from the epicenter of the quake. The plant has four large boilers operating at about 2,000 psi. Although seismic hold-down bars and pipe hangers moved to their maximum during the quake, there was no damage to the boilers themselves other than insulating materials on piping and a few bricks lost from the furnaces. The units did come off the line as a result of malfunction of electrical controls to the prime movers, but that was the only reported mechanical damage.

A major electric power converter station located about a mile from the epicenter of the quake was completely destroyed as a result of the quake, apparently due to inadequate supporting structures. It will take an estimated year and a half to put the converter station back into operation at a cost of about \$2 million. It should be noted, however, that there were no failures of pressure vessels at the facility and only minor failures of cooling pipelines.

At a nuclear power plant about 80 miles south of the epicenter there was no mechanical damage. It is reported that the quake only recorded an acceleration of 0.02 at the nuclear plant.

There were no gross failures of equipment reported at petroleum refineries and chemical plants located 35 miles south of the epicenter; however, fluid in some vessels raised and disengaged floating roofs from their guiding shoes, and contents actually slopped over some tank tops. There was also bulging around the bottoms of some of the large storage tanks; the contents had probably slopped upward, and then the force of the falling liquid exerted enough load at the bottom to cause a bulging immediately above the bottom head-to-shell joint. No failures were reported, however. Then, too, some of the measuring devices became disengaged and were inoperative following the quake.

We also had reports of two natural gas transmission lines that failed. Both lines were more than 40 years old and were constructed with the old bare-rod, acetylene welding techniques. Although we have not investigated these incidents, corrosion probably contributed toward the failures. The lines are in remote areas so that there was no catastrophic type of accident involving personnel.

There were many failures of gas and water distribution lines under the streets; however, because of the small size of these lines, that would be expected.

The engineering firm of Ayres, Cohen and Hayakawa of Los Angeles has been retained by the Federal Government to evaluate the damage resulting from this earthquake. At this writing, they had not completed their investigation and evaluation and probably will not do so for some time. The same firm, however, was also retained to make a similar evaluation following the March 1964 earthquake in Alaska, and based upon the feedback we have received to date, it appears that similar types of damage occurred in San Fernando area. Mr. Ayres fur-



There was no failure of this slip-type expansion joint, but the bare metal above and below the joint shows the violence of movement and offset.

nished us with a copy of this report concerning the damage in the Alaska quake, and he authorized its duplication. Anyone interested in a copy of that report should request it of the author or Mr. Ayres.

In general, based upon the information we have received and based upon the information obtained from the Alaska earthquake, there are several lessons to be learned:

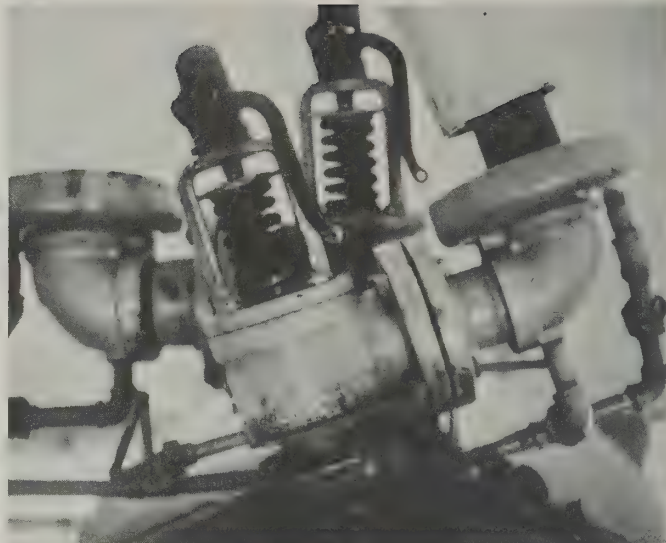
1. Equipment should be properly installed and secured to the structure in which it is installed. In other words, mechanical equipment that was properly secured to buildings or other structures remained with the structures and did not change their relative location within the structures.

2. Cast iron is not a desirable material to use for valves, fittings, or supports in earthquake areas, if the failure of cast iron might contribute to a catastrophic type failure. Many instances of broken cast iron valves, fittings, and supports were reported after the Alaska earthquake and have also been reported as a result of the San Fernando earthquake.

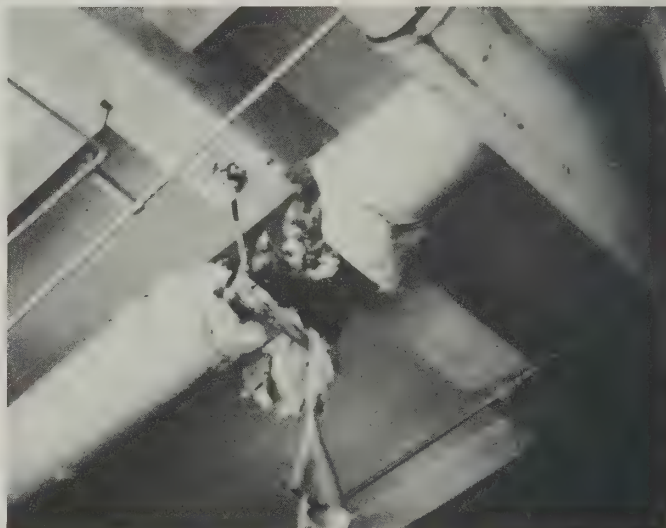
3. Threaded pipe also is not desirable. No failures of welded pipe were reported to us other than the two transmission lines which were more than 40 years old. However, many threaded pipes failed. Many welded piping systems were badly distorted, yet they did not fail at the weld or braze.

4. If transmission pipelines cross a known earthquake fault, it would appear wise to cross the known fault area at an angle other than at right angles to the fault so as to give the pipe a chance to move laterally without failing. Another alternative would be to construct the transmission lines above ground wherever they cross a fault area. We have received no reports of above-ground lines failing.

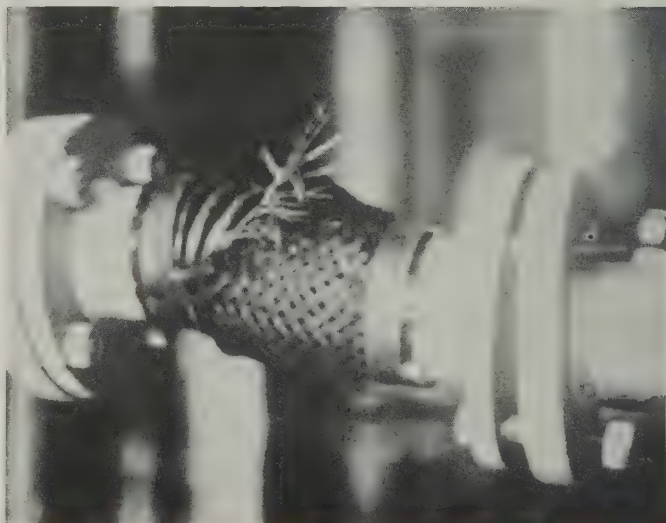
It appears to me that, by and large, our pressure vessel and piping standards are adequate; if the existing standards are followed and if the equipment is properly secured, our existing standards should provide reasonable safety.



A safety valve on top of a boiler was distorted but held, and there was no failure.



Insulation on this pipe was torn but there was no failure despite violence of movement and amount of displacement.



This flexible metal joint did not fail despite movement and displacement.

Static electricity — neutralizing industry's unseen hazard

Donald M. Johnson
Chief Fire Protection Engineer
Standard Oil Company of California

Static electricity really isn't static, in the sense of being motionless. It is generated by motion. It is generated by the separation of like or unlike bodies.

Static charges, or more correctly electrostatic charges, positive and negative, always occur in pairs and are developed when any two bodies that have been in contact are separated. The negative charges migrate to one body and the positive to the other. For significant charges to develop, the bodies must become and remain insulated from each other so that the charges—electrons—which have passed over the boundary between the bodies are trapped when separation occurs. Insulation may come from physical separation of the bodies or because at least one of them is an electrical insulator. Belts running over pulleys, splashing or agitation of liquids, flow of liquid through pipes, and spraying of liquids or solids are examples of common ways in which static charges are generated. Since static generation is a surface phenomenon, it is not generated by flow of a true gas, such as air or a vapor. When the air or vapor contains droplets of liquids or particles of dust, however, large charges can be generated.

Flow of electricity during generation is usually very small, in the range of millionths of an ampere. Voltages, however, may be thousands of volts. For these reasons, resistances of one megohm (one million ohms) or less act as short circuits and let the charges recombine as fast as they form. Also, charges have to accumulate on some electrically isolated conductive body to build up enough energy to present a significant shock or ignition hazard. Water, for example, generates static charges as it flows through pipes, but since it is a conductive liquid, the charges recombine as fast as they are separated and no significant charge can be accumulated under most handling conditions. Most refined oils such as gasoline, jet fuel, thinners and solvents, on the other hand, have very low conductivity (are good insulators) so the charges can accumulate. They can accumulate on any isolated object which they contact, and if there is none close enough, they will accumulate on the surface of the liquid. The equal and opposite charge will be somewhere nearby, as close as it can get.

If the charge accumulates on a body made of good insulating material, the hazard is not great because only a small amount of the total charge can be discharged in any one spark. The charges cannot travel through the insulating material fast enough to make a big spark. However, if the charge is accumulated on a conductive body, almost all the charge on the body can be discharged in a single spark.

Static electricity can ignite explosive atmospheres unless static build-up is prevented and sources of ignition are eliminated. In his article published here, Donald M. Johnson describes the general problem and how to neutralize the hazard. Specific safety requirements to neutralize static electricity can be found in General Industry, Mine, and Construction Safety Orders of the State Division of Industrial Safety.

In order for a static charge to be a source of ignition, four conditions must be present:

- 1) There must be a means for static charge generation;
- 2) There must be a means of accumulating a large enough charge to make a spark with enough energy to ignite the material likely to be present;
- 3) There must be a means of discharging the accumulated charge in a spark; i.e., a spark gap; and
- 4) There must be an ignitable vapor-air, or other, mixture in the spark gap.

Ignition hazards from static sparks can be eliminated by controlling or avoiding one or more of the above conditions. The most common method of control is to provide an electrical path between the two conductive bodies that hold the two opposite charges, such as a pipe and a container being filled. This is called a "bond." Sometimes the earth is used as a part of the bonding system, and it is then said that both bodies are "grounded." The important thing is that there is an electrical path between the two bodies. It can go through the ground or through some other conductor. For transmission of static charges, the path can have a resistance of up to a million ohms, which is a very high resistance by power electricity standards. To measure such resistance often requires special instruments.

Other methods of control of hazards of static electricity include reducing generation rate usually by slowing down speed of equipment or flow rate, increasing conductivity of the material to increase charge leakage rate usually by adding a conductive material such as a special belt dressing or an "anti-static additive" to liquids, or eliminating all combustible material at the points which a static spark may occur, such as by ventilation or inert gas blanketing.

Additional information on the hazards and control of static electricity is contained in NFPA-77—"Recommended Practice on Static Electricity" published by the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts 02110. For material specifically related to petroleum products, API RP-2003—"Recommended Practice for Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents" is an excellent reference. It is available from the American Petroleum Institute, 1801 K Street, N.W., Washington, D.C. 20006.

Organic phosphates — less stable but more toxic

**Fred L. DeLano, Chief
Chemistry Laboratory Services, State Department of Agriculture**

In the use of agricultural chemicals, the emphasis today is on the organic phosphate compounds. This is in part due to the desire to have less stable pesticides than the so-called "hard" or very stable chlorinated hydrocarbons, notably DDT. It is also in part due to insect resistance.

Most of the organic phosphate insecticides in current use are of the thiophosphate ester type. These evolved from the nerve gases developed in Germany before or during World War II, where their insecticidal characteristics were noted. Of interest is an American patent in 1934 for phosphate esters, but no insecticidal properties were mentioned. The mode of action of these phosphate compounds is to attack the nerve endings. Frequently their metabolites, or partial breakdown products, are more toxic than the parent compound. For example, parathion is twice as toxic as parathion. This feature lends itself to further effectiveness, but since they break down fairly easily they are short-lived in relation to chlorinated hydrocarbons.

In general, the organic phosphates are more toxic than other insecticides, but this is a highly variable factor. For example, TEPP's (tetra ethyl pyrophosphate) toxicity to rats is 2 mg per kilogram of body weight (or roughly the equivalent of one small drop to kill a 150-pound man), the toxicity of malathion to rats is 1200 mg per kilogram of body weight. The accompanying chart illustrates this. Malathion, used in one known suicide case, very closely approximated this figure for its toxicity to man.

The hazards of organic phosphates are due to their capability of being absorbed through the skin, as well as being inhaled as vapor or swallowed. One fatality was due to parathion wetting the knit wristlet of rubber-covered gloves the man was wearing and thus giving him the fatal dose. He was working alone and was found dead on his tractor.

The most dangerous chemicals are under strict control by the State Department of Agriculture and are on the injurious chemical list. They are also controlled through the system of permits for their sale and use issued by the county agricultural commissioners. The commissioners enforce the regulations and make sure the necessary safeguards are known and used; that the property sprayed is posted; and their use is in a manner that will not harm people, crops, property, or animals, including bees, but only the target species.

One hazard now being investigated is the danger to workers harvesting crops 30 or 40 days after spraying. Constant contact with small residues on the foliage has led to some injury to workers; one consequence was adding two more chemicals to the injurious chemical list. The matter is being studied by industry and by the Departments of Industrial Relations, Agriculture, and Public Health.

The safe use of organic phosphates is accomplished by the use of practices and equipment stated on the label, and by education and licensing of users.

California has had a comprehensive pesticide regulatory program for many years. One primary regulation requires registration of each pesticide. Before a product is registered, the manufacturer submits information on the material. This includes its acute and chronic toxicity, its effectiveness against the pests, and information concerning any hazard involved in the use of the product. It includes methods of analysis of the material and of its residues on crops.

A second regulation requires licensing of agricultural pest control operators. Before engaging in business of applying pesticides, a person is required to obtain a license from the Department of Agriculture. He must demonstrate his knowledge of the nature and effect of the materials being applied. If he is to apply the material by aircraft, besides being a licensed pilot, he is further required to demonstrate his knowledge to be licensed as a pest control operator. He must also register in each county where he will apply pesticides.

A third control requires the listing of injurious materials or injurious herbicides. These can only be used by permit from the county agricultural commissioners. The injurious materials are designated so because of their high toxicity or special hazards, and it is illegal to sell them except to persons having a permit to use them. Included on the list are the hazardous organic phosphates and others as well, such as herbicides and sodium arsenite.

The State Division of Industrial Safety, Department of Industrial Relations, oversees the safety of workers in the field handling or applying agricultural chemicals, as well as workers in plants where the chemicals are formulated or manufactured. The Department of Public Health is involved also in the health aspect. The California Highway Patrol is involved in permits for transporting the poisons, and has a procedure for accidental spillages on the highways. The safe handling and disposal of used pesticide containers has been studied by the California State Departments of Public Health, Agriculture, and the University of California, Agricultural Extension Service, and there has been published a tentative guideline. Others involved include Agricultural Commissioners Association, Agricultural Chemicals-Apiary Committee, California Division of Industrial Safety, California Highway Patrol, and Western Agricultural Chemical Association. Regional water quality control boards recommend disposal sites for used pesticide containers, and air pollution control districts must approve incinerators where containers may be burned.

There are more laws and regulations covering the use of agricultural chemicals than there are for most other industrial or agricultural commodities. The continued use of these chemicals is essential to produce the necessary food, feed, and fiber and to maintain agriculture as the leading industry in California.

1500

1400

MALATHION 1375

1300

1200

1100

1000

COMPARATIVE ACUTE TOXICITIES OF SOME INSECTICIDES

The Higher the Bar—the Safer the Insecticide—based on oral tests with rats. The number on each bar refers to the LD₅₀, a standard toxicology measurement. It is the number of milligrams of the insecticide per 1000 grams of body weight of the test animal that is required to kill 50% of the test animals.

900

Sevin 850

800

700

Dipterex 630

600

500

400

300

200

100

TEPP 2.0

Thimet 2.2

Phosdrin 6.1

Demeton (Systox 6.2)

Parathion 13.0

Guthion 13.0

Methyl parathion 17.5

Endrin 17.8

Trithion 30

Aldrin 39

Dieldrin 46

DDVP 80

Lindane 87.5

Toxaphene 90

Heptachlor 100

Diazinon 108

DDT 113

Dimethoate 215

Chlordane 335

HIGHLY TOXIC

MODERATELY TOXIC

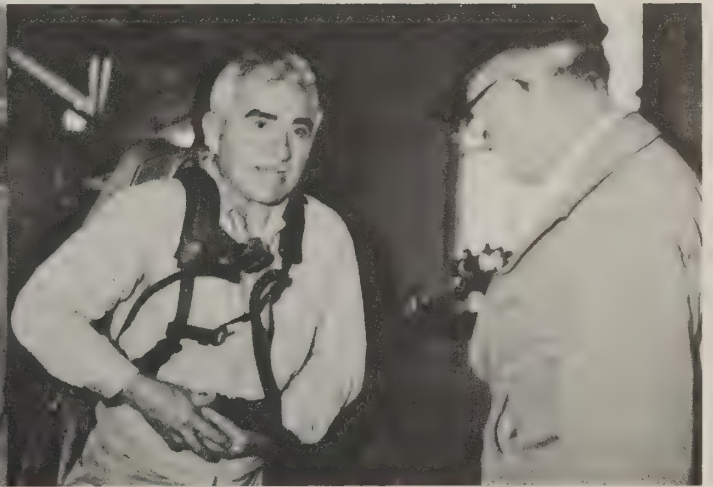
SLIGHTLY
TOXIC

Engineers of the Division of Industrial Safety, headquartered in Northern California, went through rigorous training in February, learning about underground rescue apparatus. The U.S. Bureau of Mines conducted the three-day workshop at their Alameda headquarters. At bottom left is Bill Lindsey, construction safety engineer; at right top, is Gordon Bunker, construction safety engineer; at right center, are Larry McCune, senior industrial safety engineer (left) with William Shaw and Reginald Irvine, construction safety engineers; at bottom right, are shown (standing) Irvine, Lindsey, Bunker, and McCune. In the front row are Bureau of Mines personnel.



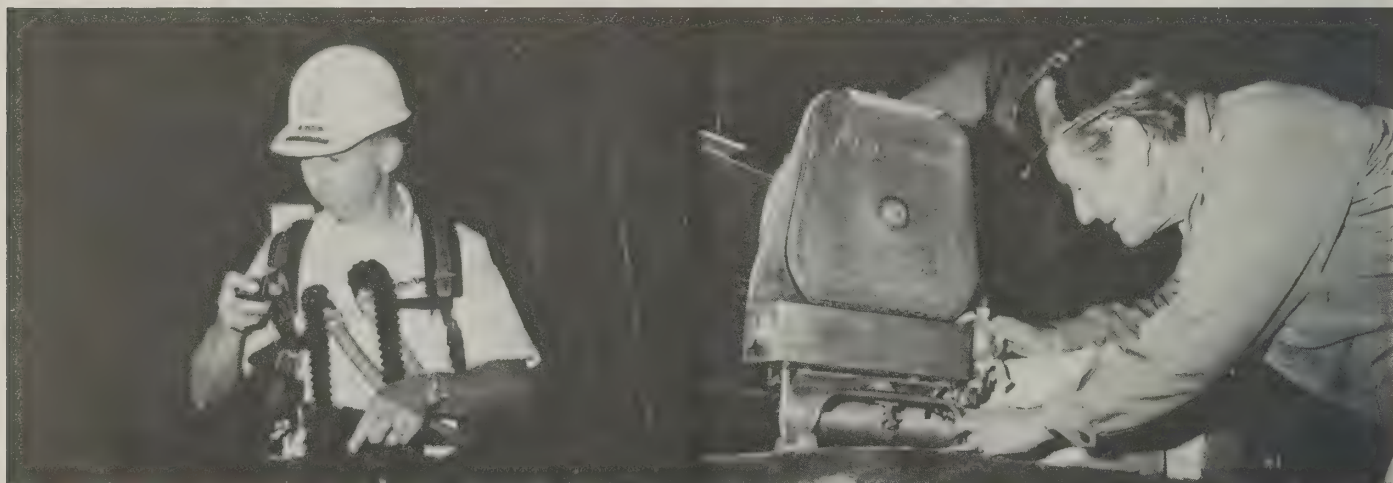
Special training for DIS engineers

Engineers of the Division of Industrial Safety in Southern California also were trained in maintenance and use of special breathing apparatus for use in confined spaces or underground. Shown at bottom, left, are Donald Metzler, industrial safety engineer, and William Huebner and Robert Bailey, construction safety engineers, being trained in the use and maintenance of a safety lamp for detecting flammable gas. At bottom right, Metzler and Huebner check out special breathing apparatus for use underground.





At left, a group of DIS safety engineers headquartered in Southern California assemble and check special breathing apparatus. Robert Bailey, industrial safety engineer (bottom right) and Ray Rooth, construction safety engineer (below left) get the feel of the equipment and check oxygen supply for the breathing apparatus.



Safety Education

Variety of aids for visual messages

Don Adams
Motion Picture and Education Markets Division
Eastman Kodak Company

The first two parts of this series discussed the value of using audiovisual aids for safety training and the choice of media. In this final section, we will deal with the basics of production and presentation of slides and film.

What equipment does the still photographer need in order to effectively produce slides? First, he needs a reliable camera with which he is familiar. This need not be a big expenditure. To photograph artwork, he needs a copy stand to hold the camera firmly in place. Copy stands can be purchased or Kodak has plans available which describe how to build a do-it-yourself stand for under \$10. The copy stand should be rigid for accurate exposure of the art even with long exposures. An exposure meter will be necessary, unless it is built into the camera. Floodlights should be attached or positioned on

either side of the stand aimed at 45-degree angle to the artwork to provide even illumination of the copy. Two Kodak publications, "Producing Slides and Filmstrips" (S-8) and "Slides With A Purpose" (VI-15), provide suggestions on the selection and use of copying equipment.

For shooting slides on location, the still photographer also requires a sturdy tripod and several portable photo floodlights. Floodlights are available at most camera stores in kits as small as attaché cases. If location shooting will be under fluorescent lights, it may be necessary to use compensating filters. Kodak publications can provide helpful filter information.

If the slides to be produced are for an audiovisual program, color film should be the choice. It adds authenticity, clarity, and interest to a presentation. The choice of film will depend upon whether the photography will be of flat copy or on location. When a large number of

prints will be necessary, a negative film, Kodacolor-X, may be most suitable.

On-location shooting under existing lights may be done using a high speed film such as Kodachrome-X, Ektachrome-X, or High Speed Ektachrome Film. However, if the light meter (either hand-held or in the camera) indicates the available light is insufficient, then the floodlights will be necessary. A basic lighting setup consists of three lights. The main light or key light is positioned high and to one side of the camera. A second light is positioned on the opposite side of the camera and acts as a fill light. It fills in the shadows caused by the key light. Finally, a third light or background light is aimed at the background to balance the overall lighting.

After shooting is completed, the exposed film can be processed in-plant or sent to a commercial laboratory. Using a KODAK Audiovisual Mailer (AVP-1) provides expedited service, which means the finished slides will usually be in the return mail within three days. (The AVP-1 mailer cannot be used for Kodacolor-X film.)

When the slides are returned, they can be projected directly and then arranged, or viewed on an illuminator, arranged and then projected. The slides are laid out in the same order as outlined by the planning board cards. The illuminator is a box containing lights with a plastic tray in the front and supports to hold the slides. Light shines through the plastic surface and illuminates the slides. When the slides are finished being sorted and edited, they can be loaded into projection trays.

The final production step involves relating the script to the visuals. The script might be a straight-forward narration or a guide providing the speaker with key words, phrases, and background information. It is also possible to produce a recorded, synchronized dialogue with music and sound effects. The first step in preparing the audio portion of any program is to project the slides and roughly talk through the script. Eliminate awkward words or phrases, time the narration to match the slides and give the slides a final rearrangement if necessary. Whether the narration is to be recorded or given live, make the script simple and direct. If the narration is to be given live, key phrases can be underlined for emphasis and importance. The speaker can be encouraged to "fill in" with his own words as he learns the script.

Narration, background music, and where necessary, appropriate sound effects can be recorded on a reel-to-reel or cassette tape recorder. If sound effects and music are to be "mixed" behind the narration or dialogue—more than one tape recorder may be needed. Music and sound effects can be very effective and do give the professional touch to a visual presentation. Along with narration, "silent" electronic impulses can be recorded onto a stereo tape using the Kodak Sound Synchronizer. The signals are electronically placed on one track of the stereo tape and when played back will automatically trip the slide projector at the appropriate times. This means that a slide-tape safety presentation could be set up at a convention and run to conclusion unattended.

More specific audience participation is possible with the Kodak Random Access 960 Projector. Any of 80 slides contained in the tray can be dialed and viewed in seconds using the remote control. This projector is also quipped with automatic remote control focus. The RA 960 Slide Projector permits a speaker to select, omit, or review slides at his command. This projector can also

be utilized in a "teaching machine" mode. A student listens to the narration and dials an answer from a multiple-choice of slides. The narration then tells him what he should be seeing if he is correct or the number of the correct slide if he is wrong.

Using a Kodak Dissolve Control, two Kodak Ektagraphic or Carousel Slide Projectors, and the new 140 capacity slide tray, a total of 280 slides can be alternately viewed. The Dissolve Control permits a smooth dissolving from the image of one projector to the image of the other projector, giving a more professional look to the visual program.

With the availability of the Kodak Ektagraphic Arc Slide Projector, a slide program can be shown effectively to large audiences in auditorium situations.

The Kodak Ektalite Projection Screen which is available in 40 x 40-inch and 18 x 25-inch sizes is curved into a section of a parabolic sphere and reflects light back toward the audience. It reflects an image six times brighter than other screens, even in room light with unshaded windows.

The production of motion pictures for industrial safety education is based upon many of the same ground rules as slides. Super 8 movie cameras are available for under \$30 but it is also possible to spend several thousand dollars for a first-class 16 mm movie camera. The size of the intended audience, quantity of prints required and budget can dictate whether super 8 or 16mm film is used. For safety training engineers working with small budgets and limited time, super 8 film provides convenience and simplicity. The equipment may consist of a camera such as a Kodak Ektagraphic M9 Cartridge-Loading Super 8 Camera, a sturdy tripod, and lights similar to those mentioned in still photography. The M9 Camera has a built-in meter, power zoom, and various frame rates. Both color and black-and-white films are available in super 8 cartridges. Kodak Publications, "Movies With A Purpose," (V1-13) and "Basic Tilting and Animation for Motion Pictures," (S-21) and helpful booklets that cover the planning, producing, and presenting of movies. Single copies are available free upon request from Eastman Kodak, Dept. 412-L, Rochester, New York 14650.

A completed 50 or 100-foot roll of super 8 film can be dropped into a Kodak projection cartridge and viewed on the new Kodak Ektagraphic 120 Projector. This projector threads and rewinds automatically, yet the film is readily accessible and can be loaded on the spot. A "library" of such cartridges can be labeled and catalogued like books. New employees, or persons taking refresher courses can select and watch films unsupervised.

Another projector, the Kodak Ektagraphic MFS-8 (Motion Film Strip) Projector can control a roll of super 8 film that has been coded. The film is cued to stop on a specific frame. The film is advanced as the projector senses the cue marks, or, the viewer has the ability to override the cues. This gives the safety engineer a projector that shows a super 8 film normally, or a film with the versatility of over 3,000 individual frames.

The availability and simplicity of equipment, and the selection of helpful literature on planning, producing, and presenting visuals, can provide the safety engineer with a sound basis on which to build programs that fit the requirements of his special field.

For a list of Kodak Audiovisual Publications, write to Dept. 412-L and ask for Kodak Pamphlet MPE-1.

*Industrial safety is a partnership between many forces, institutions, groups, and people operating in the workplaces of California. Among the most important are representatives of the insurance industry. The safety programs of many insurance companies can help by example spread the innovative and effective methods of preventing job injuries. Below and on page 30 are articles that describe part of the programs of two insurance companies, the latest in a continuing series published by **California Safety News**.*

Argonaut Insurance emphasizes training for firm's supervisors

William H. Dubs, Engineering Manager
Argonaut Insurance

Supervisory Safety Training programs are developed by Argonaut Insurance Co. to fit the needs of its policyholders engaged in construction operations. Because of the varying depths of safety knowledge possessed by supervisory personnel among contracting firms, the programs are designed to supplement this knowledge, and to assist the policyholder's management in developing each supervisor to become more efficient in the conduct of his work activity.

Argonaut strongly feels that the whole subject of loss control should be treated with the same emphasis given any management problem. Safety must be made an integral part of production, and the attitudes of supervision must be oriented to the concept that loss control, whether it involves control of personal injuries, damage to tools and equipment, or production rework, must have the same identity as "production".

Prior to the programming of supervisory safety training into a policyholder's operation, Argonaut's engineers first determine the depth of the general safety knowledge, hazard recognition ability, and the attitudes of both supervision and management. With this information as a base, the company is then in a position to confer with top management and integrate a safety training program into the framework of a firm's existing loss control activity.

Argonaut's experience with a long-time policyholder, Underground Construction Co. of San Leandro, is typical. This 36-year-old Bay Area construction firm employs an average of 300 to 500 workers and may have more than 50 specialized construction jobs underway at any one time. Four company divisions operate throughout California: Heavy construction; Pipeline; Telephone; and TV Cable. The firm has acquired a fine reputation as a modern and progressive construction company with a sincere and active interest in accident prevention.

Argonaut has tailored supervisory safety training for Underground Construction to the needs of that company. This approach has paid off with an effective and progressive program, well-received by the firm's management and field supervision. Underground has enjoyed a low worker injury rate and has been successful in developing supervision to accept the concept that top knowledge of, and application of safe practices, is a prime specification in order to run a profitable business. Argonaut has successfully used this policyholder's loss control activity as a framework of its supervisory training program. As a result, training has been integrated into the following areas of this contractor's safety program: Hazard Detection and Control; Management-Supervisory Production Meetings; and Safety Communications.

Hazard Control and Detection

An active day-by-day training approach is carried on by Argonaut's senior engineer, Rich Beard, who calls on Underground Construction's job sites to detect job hazards and discuss control measures with the supervisors. With his broad technical background in construction safety, he is able to communicate to the field supervisors. Varying depths of safety knowledge, and the hazard detection capability of individual supervisors, require him to spread his field time to those requiring greater assistance for development. This direct day-by-day, job-by-job contact by him is one of the most important parts of the Argonaut approach.

Excellent cooperation has been attained between Underground Construction Company's safety engineer, Tom McManus, Jr., and Rick Beard. Joint tours of current jobs are made and this team action has been very effective.

Management-Supervisory Production Meetings

Underground holds quarterly meetings with supervision representing the firm's four operating divisions. Top management is present at all of these meetings. Agenda for these meetings cover a wide range of subjects relating to cost accounting, management of field personnel, and construction techniques. Sharing equal emphasis is the subject of loss control and safety of operations. Tom McManus chairs that portion of the meeting allocated to the discussion of loss control. Rick Beard has an active part at each meeting, and discusses subjects aimed toward improving the base knowledge of supervision in safety of operations. The meetings usually number 75 to 85 of the insured's key supervisory personnel.



Argonaut senior engineer Rick Beard uses the chalkboard to illustrate a specific hazard and how to control it. This was a quarterly meeting of managers and supervisors.

Argonaut's presentation at these Management-Supervisory meetings is well planned in advance. Visual aids are used as much as possible, concentrating on technical problems inherent to underground construction work such as shoring systems, ground movements, cave-ins, working in confined spaces, and allied subjects such as vehicle safety, traffic and pedestrian protection. In addition to these technical subjects, a discussion of ways and means to more effectively communicate safety knowledge to workers is covered.

In addition to quarterly meetings, each division holds monthly meetings of its supervisory personnel, and the agenda are made up of subject matter to be discussed similar to that of the quarterly meetings.

Safety Communications

In order to disseminate technical safety information to supervisory personnel, McManus prepares weekly bulletins. These bulletins are made simple, often containing a sketch or cartoon on some technical safety subject. The text is usually kept to a minimum in favor of visual material to communicate vital information more effectively. McManus does an outstanding job in preparing these mimeographed bulletins, which are fast and easy to produce, easily understood, and more important, well-received by supervisors and workers. Information relating to special job hazards and suggested control measures is distributed to McManus by Argonaut's engineering

department to supplement his material to be included in the weekly bulletins.

By use of these bulletins, each supervisor receives a continual flow of information designed to improve his ability to communicate safety to his employees, and to do a better job to minimize employee injuries and loss incidents involving the general public, equipment, and construction rework. The information is used by each supervisor as subject material at weekly tool box meetings held with his employees.

Realizing that it is highly essential that top management of any firm be informed of accident prevention results, Argonaut meets regularly with Underground Construction's management. The Argonaut engineering department uses these meetings as feed-back channels to direct control measures to reverse adverse accident trends, to pinpoint job supervisors requiring special attention, and the planning for future management-supervisory meetings.

It is Argonaut's philosophy that supervisory safety training programs have to be flexible to be accepted by a company's management and supervision. The programs must logically fit hand-in-hand with any other training activities management takes to improve production efficiency. Failure to equate accident costs with the traditional production cost factors can only lead to supervisors' indifference to accident prevention.

Liberty Mutual maintains varied training programs

**Lovell C. Chase, Division Service Manager—Policyholder Training
Liberty Mutual Insurance Company, San Francisco**

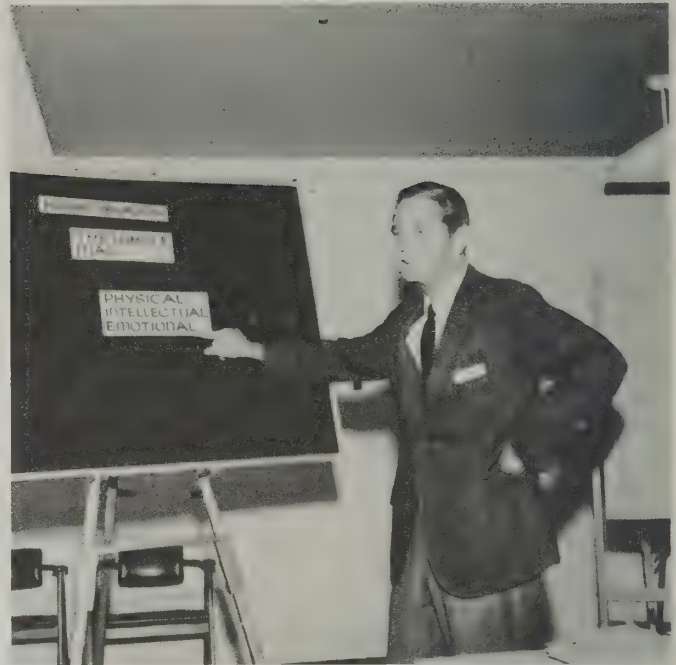
The name of the game is training! Today's executive is a training conscious man. Industry indoctrinates its new hires. Industry gives "on the job" training to its workers. Industry pulls First Line Supervisors off the floor to give them Supervisor Development Training. We even send our V.P.'s to college again to train them to be more effective managers.

To put it another way, today's executive recognizes that the very health and growth of his company is directly proportional to the effective utilization of his total manpower. Helping each person and, therefore, his group to perform at an optimum level that will produce effective use of total manpower is the concern of every individual in the organization who has anything to do with teaching or motivating or training people. And doesn't every Supervisor, every junior executive, in fact every member of the management team have some responsibility for teaching, motivating, and training, including the Safety Director?

Liberty Mutual—A Leader In Accident Prevention

But why should an insurance company feel obligated to set up Training Institutes for its policyholders? Liberty Mutual Insurance Company writes all lines of Casualty Insurance. Since 1936 Liberty Mutual has written more Workmen's Compensation Insurance each year than any other insurance company in the country. But, even more interesting to those in the safety field, is the fact that the first man the young fledgling company hired when it was first getting organized over fifty years ago was a Safety Engineer. This man, David S. Beyer, was the first Safety Engineer on any casualty insurance company payroll. Liberty Mutual felt then, and still does, that it has a major obligation to its policyholders to help them control unnecessary accidents.

During the early 1960's we noted that the accident frequency trend of all industry, which had been going steadily downward for thirty years, had suddenly leveled off. Then frequencies started to rise. We restudied the job of the Safety Engineer, the Safety Director, the man responsible for the promotion of the accident prevention control program, to find out where he was slipping. The more we re-studied his job, the more impressed Liberty Mutual Insurance Company Loss Prevention people became with the central importance of training as a continuing responsibility. If people are going to perform at optimum level, they must be trained to work safely and efficiently.



Bayley Bunce uses the flannel board to develop the thesis that managers have to be concerned with the "whole man"—physically, intellectually, and emotionally.

Management Needs Productive People

Management is the art and science of getting things done through people. Those last two words, through people, provide the key. Management cannot get the job done if people are not on the job or if the man's machine or equipment is out of kilter so that he cannot produce. The Safety Director's place on the management team is to develop ways and means of getting the people to perform their duties with such efficiency that no production-interrupting accidents occur; that no one is injured; that no equipment is accidentally damaged.

The Safety Institute Program

So often a man is appointed Safety Director with little or no safety experience or background. Through no fault of his own, he not only gets little assistance in meeting his objectives, but he may not even know what his objectives should be. He needs guidance!

Liberty Mutual recognized that these Safety Directors needed a helping hand. So we decided the time had come to give management an assist in training his inexperienced and, consequently, less effective Safety Director, to do the job that is expected of him. To give management that assist, Liberty created its Institute Program and developed a staff of qualified, trained faculties in these Institutes.

The program consists of five different Institutes, each created to help the Safety Director progress to the goal of an accomplished Safety Manager—one who can properly accept his share of the load in helping management complete its objective of getting things done through people; of helping each person and, therefore, his group perform at an optimum level. Let me explain each Institute briefly.

Safety Training Institute

The Safety Training Institute is just what the doctor ordered for the new, inexperienced Safety Director. This Institute was put together for the man who, a few weeks before, might have been a foreman, an engineer, or a member of the Personnel Department; but who was told by his boss one day, "Tomorrow, Bill (or Jack, or Bob) you are responsible for the Safety Program in our plant."

At this Institute, Bill (or Jack, or Bob) learns just where his new responsibilities dovetail into those of other people on the management team. For the first time, in many cases, he learns the proper description of the Safety Director's job. Following the Institute, he goes back to his plant knowing that he cannot prevent accidents, but that he is expected to help and guide the rest of the management team in building safe work methods into everyday performance. He learns about record-keeping and fact-finding. He finds that material handling accidents and injuries can be controlled. He picks up new ideas about effective fire protection. Low-voltage electricity hazards and ways of controlling them become understandable. He shares his experiences with others at the Institute so that each is in a better position to set up or improve his own plant Safety Program.



(Above) Buzz groups get pretty animated. In the group are Joe Fido, plant engineer of Singer Librascope (left), John Hulsebus, industrial relations manager for the Holly division of Lear Siegler, Inc., (center), and Gary Proseus, supervisor of personnel administration for Libby, McNeil and Libby. (Below) Shown planning Institute programs are Bill Wolf, Pacific Division loss prevention manager (left), Lovell Chase, Institute Director (center), and Kathryn Kelly, R. N., occupational health consultant.



At the Safety Training Institute, the inexperienced Safety Director not only learns how to make an effective Accident Investigation, but he also learns how to pass on this technique to the Supervisors in his plant so that they, in turn, know how to make an effective investigation that can prevent repetition of accidents in their own departments. The Safety Director is trained in how to protect against machine hazards; he learns how to stop people from falling. He even receives enough instruction about Industrial Hygiene so that he can recognize an industrial health problem in time to ask for help from an expert before trouble develops. In short, this Institute provides basic Accident Prevention information and techniques to help the inexperienced man do what management expects of him. It provides fundamental know-how.

Safety Management Institute

The Liberty Mutual Safety Management Institute was created to do exactly what its name says—to teach the Director how to do a better job of managing his Safety Program. It is not intended for the neophyte. Rather, it is the next step up for the man who has already attended a Liberty Mutual Safety Training Institute, or for the professional who has been around long enough to be well grounded in basic Accident Prevention fundamentals.

At this Institute, the professional Director is helped to understand why people do things the way they do. He also has an opportunity to compare his communication techniques with those of experts so that he can learn why he so often fails to get through to his people.

A common complaint of the safety professional is that he has difficulty selling his program to his own management. At this Institute he has the opportunity of studying techniques used by specialists who have researched the most convincing methods of dealing with top management personnel—those who decide on proposed programs as well as the financing.

For the first time, many Safety Managers have an opportunity to explore the field of Public Liability and Product Liability management. Product Liability Control, particularly, has developed in the last few years to a major responsibility with an influence on successful production and sales. Product Liability costs have reached the level where the successful Safety Manager must include them in his thinking and planning for successful Accident Cost Control.

Training Methods Institute

Many Safety Managers told us that the Safety Management Institute helped them recognize their responsibility for training and developing Supervisors to accept their responsibility for Accident Prevention. "But," they said, "no one tells us how to do it." The Training Methods Institute is a "how to do it" program—those attending study effective techniques and can experiment or practice these techniques. And when they return to their home base, they are ready to put into practice the techniques they have practiced in the workshop.

Knowing that about 90 percent of all accidents are caused by people forces the Safety Manager to accept his role of trainer and to make training a major function of his overall Accident Prevention duties. The Training Methods Institute teaches him to be a trainer of trainers. He learns how to train his Plant Supervisors to properly train the men under them.

Fleet Safety Management Institute

Liberty Mutual also has a Fleet Safety Management Institute which is designed for the Trucking Fleet Safety Supervisor to help him manage his program in the same way that the Safety Management Institute aids the Plant Safety Manager. While there is some duplication in the two Institutes as regards the handling of people, the Fleet Safety Management Institute takes direct aim at problems peculiar to Fleet Operations. For instance, the Director learns how the successful operator selects drivers who will get the job done without smashing up the equipment, and he is brought up to date on the latest techniques to control cargo losses.

The Safety Manager learns how he becomes a true part of the management team through the use of fact finding techniques that enable him to spot those "factors" affecting insurance costs. He even has the unique opportunity to observe a "talking your way through traffic" ride so that he, in turn, can teach his drivers "Decision Driving" techniques.

Environmental Health Institute

Liberty Mutual has still one more Institute. This is the Environmental Health Institute designed for the Safety Director or Safety Manager who has industrial health problems in his plant. This Institute will not make this man a professional Industrial Hygienist or a Health Physicist. But when he comes away from this Institute, the Safety Manager does have a pretty complete understanding of what industrial health hazards he should be on the lookout for. He will have a good knowledge of the instrumentation that is used to check whether these hazards exist in his plant and, if so, whether they are serious enough to need attention. He will come away with a better knowledge and understanding of maximum allowable limits. Best of all he will know where to go for expert help when he does spot industrial health hazards in his own organization. To put it plainly, he will be able to do a more complete job of managing his complete Safety Program because he will have a more accurate knowledge of industrial health hazards.

Applied Adult Learning

Liberty Mutual recognizes that adult education is a different process than child education. To begin with, the material used must have relevancy to adult, real-life job situations. It cannot be hypothetical—it must include problems, situations, concepts, etc., which are involved in what the adult does every day, or what he will be doing in the future.

Modern Industrial Training Programs are built on these facets. Thus, to make our Liberty Mutual Insti-

tutes successful, we simulate the relevant, real-life job situations faced by those Safety Directors and Managers attending the Institutes. Long experience has demonstrated the validity of the following learning techniques. Liberty Mutual uses these techniques in the Institutes.

First, we get participation by the learner in the training-learning process. We get him to participate physically by taking part in a demonstration or in some way being a part of the activity. He must participate intellectually through discussion and questions and answers. The Liberty Mutual Institutes insist on "cross pollination" of all the participants.

Some of the techniques that are accepted as effective in generating adult involvement are Role Playing, Incident and Case Method Stimulation Exercises, and Conference Participation. Liberty Mutual uses them all in the Institute Program. If there is any single aim that gets more concentration than anything else, it is "involvement". We use all kinds of visual aids to stimulate participation. We use the flannel board, the overhead projector, the blackboard, demonstrations, and questionnaires. The Institutes break down the larger group into small, buzz-session discussion groups so everybody has a chance to put in his two cents worth.

Do Job Safety Institutes Pay Off?

The Liberty Mutual Institute Program is best summarized by saying that it brings together Safety Directors and Safety Managers with similar backgrounds to help them share experiences and involve them in discussion and study so that they can better manage all aspects of their Accident Prevention Program.

The partial list of companies that have sent representatives to the Institute reads like a Who's Who of Industry—United Parcel Service, IBM, Continental Can Company, Kennecott Copper Company, Consolidated Freight Lines, FMC Corporation, Del Monte Corporation, ITT-Continental Baking, Campbell Soup Company, and United States Plywood-Champion Papers. Why are these companies willing to let their people take three or four days away from their regular work? I think the answer is that the Liberty Mutual Institute Program, through its discussion, workshop, and study, sends back trained Safety Directors and Managers ready to do a better job of helping their fellow men; to do a better job of keeping people working safely and productively for themselves, their families, and their companies. The Institutes help those who attend become a more effective member of their management teams—more effective in "getting things done through people" and getting things done safely through people.

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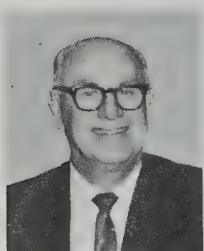
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Chiefly speaking

The Division of Industrial Safety had another busy year in 1970. This large State continues to grow and the number of industrial establishments and the number of employees keep increasing.

In 1970 the Division made:

- (a) Over 137,000 original accident prevention surveys, and its safety engineers were successful in having over one-quarter million unsafe conditions corrected. More than a quarter of a million is a lot of anything, and to eliminate that many unsafe conditions in industrial establishments last year represents to me, and I'm sure you, too, will agree, a substantial number of fingers, arms, feet, legs, and lives saved that otherwise would have been lost;
- (b) The Division made 41,000 special calls and gave top priority to, and investigated, over 6,600 complaints from California employees;
- (c) In an effort to give renewed vigor to regional meetings of the Governor's Industrial Safety Conference throughout the State, I am happy to report 54 such sessions were held last year. These area safety confabs attended by management and workers did much to educate and motivate these people in greater safety participation;
- (d) The Division's engineers made 308 safety speeches all over the State during the year.

The Division distributed more than 100,000 safety brochures, sent out in answer to written and phoned requests, and a new high of 543 safety films were loaned out for showing by various groups.

"Tailgate Topics," a Division publication started in 1968, continues to give outstanding safety service in the form of

information to assist supervisors and workers at their short but effective safety meetings usually held each week. Hardly a day goes by that I don't receive a complimentary letter about these safety messages. One of these came from a major oil company requesting permission to reprint 25,000 copies of a certain issue.

No report of this kind can overlook the Division's quarterly California Safety News. This sixteen-page release provides timely safety messages for 10,000 readers.

The year 1970 has also been an active one for the Industrial Safety Board and the Division in the adoption of new safety regulations. New safety orders requiring improved boomstops on construction and industrial cranes were adopted; California's Unfired Pressure Vessel Safety Orders underwent a general revision; new noise control standards meeting Walsh-Healey provisions were adopted and Threshold Limit Values for exposure to harmful substances were updated; revised Construction Safety Orders were adopted to provide adequate roll-over protection, seat belts, fenders and emergency brakes for most construction vehicles; also adopted were new safety regulations governing the manufacture, handling, and use of explosives within various industries and operations in California.

The year of 1971 promises to be equally active. Public hearings have already been held on proposed high-voltage electrical safety orders, the first such regulations in the nation. Work is well under way on development of new regulations relating to storage and transfer of compressed or liquefied natural gas to be used as motor fuel. Committees are being formed in the development of roll-over protection regulations suitable for industrial trucks, agricultural tractors, and similar equipment not covered by the Construction Safety Orders. New safety orders applicable to the use of helicopters for construction work are being developed. Plans are under way to revise the Construction Safety Orders covering access requirements during construction of multi-story buildings. Preliminary work is in progress on tunnel safety order revisions and on construction passenger elevators. Another sizable project involves the development of proposed regulations requiring such things as boom swing limits, load indicators, weld testing, inspections, certifications, etc., for California cranes. This latter project is one assigned to the Division by Senate Concurrent Resolution No. 44 issued in 1970.

Jack F. Hatton

Lower injury rate an important gain

... It may never be possible to completely eliminate the hazards of life. But we have made considerable progress in eliminating unnecessary risks and in learning to avoid or prevent those hazardous situations which can bring injury or death.

California has been a pioneer in developing effective safety codes and procedures and the results show up in the statistical tables. Our industrial injury rate has been lowered by more than 25 percent in the past 20 years. And I am proud that some of the most spectacular progress has occurred during the last four years. California's all-time low injury rate of less than 31 (30.8) injuries per thousand workers was established in 1967. This was followed in 1968 by the second best rate in the state's industrial history. There was a slight fractional rise in the injury rate in 1969. But preliminary figures indicate that a new all-time low will be established in 1970, possibly as low as 30.5. Injuries for the year 1970 will total about 5,000 less than for 1969.

These gains are important. Every accident that doesn't happen saves immeasurable human suffering. It also produces substantial dollar savings in our economy. . . .

*Governor Ronald Reagan
excerpted from his
address to 1971 GISC*

The 1971 Governor's Industrial Safety Conference witnessed some historic "firsts"—the first public discussions of the Federal Occupational Safety and Health Act and the Governor's announcement of the selection of the Department of Industrial Relations as "exclusive State agency to administer California's occupational safety and health plan" under the Federal law. And for the first time, the GISC, meeting February 18 and 19 at the Los Angeles Biltmore, set aside its second day of deliberations to participate in an emergency symposium on earthquake hazards and to hear reports on the Los Angeles earthquake of the previous week.



Agriculture: John Barnes, DIS conference consultant; Cliff Jameson, cochairman; Charles Farrell, DIS conference consultant. (Not shown: Harold Copley, cochairman; William Lloyd, Jr., cochairman; Joe Precissi, cochairman.)



Governmental Agencies: Grant Kingon, DIS conference consultant; Carl Summe, cochairman. (Not shown: John Bear, Selma Dritz, Harold Eldredge, cochairmen; Fred Hull, DIS conference consultant.)



Construction: Standing, Edmond Gale, cochairman; Paul Kral, cochairman; Robert Jinkens, DIS conference consultant; sitting, Willis Pugh, DIS conference consultant; George Zack, cochairman; Leo Westwater, consultant.



Manufacturing: Standing, Samuel Willis, cochairman; Chester McCloskey, cochairman; Henry Hartmann, DIS conference consultant; sitting, John Chocholak, DIS conference consultant; Al Arismendi, cochairman; Ralph McConnell. (Not shown, Robert J. Wayne, cochairman.)



Mineral Industries: Standing, Larry McCune, DIS conference consultant; Byron Ishkanian, DIS conference consultant; Morgan Schilling, cochairman; sitting, Benton Bailey, cochairman; Andrew Christensen, cochairman. (Not shown, Melvin Ferron, cochairman.)



Trades and Services: Standing, Thomas Macnair, cochairman; Harold Goddard, DIS conference consultant; Emlyn Cox, DIS conference consultant; sitting, Richard Vasquez, cochairman; Bertha Metro, cochairman; Jack Evans, cochairman.



Transportation, Communications, Utilities: Standing, Andrew Brozik, DIS conference consultant; Carl Pulliam, cochairman; Haril Whetsell, DIS conference consultant; sitting, Julius Stern, cochairman; Robert Rivers, cochairman; Stan Ossman, cochairman.

Landmark law begins new job safety era

Major provisions of Public Law 91-596, Occupational Safety and Health Act of 1971, are reviewed opposite, on page 5, excerpted from a summary prepared by the National Safety Council.

... The new Federal Occupational Safety and Health Act of 1970 recognizes on the national level that more must be done to prevent the massive losses in manpower and money from the thousands of on-the-job injuries that occur each year in the United States.

The new federal act puts the adoption and enforcement of occupational safety and health regulations under the nation-wide control of the Secretary of Labor. But the law provides that the Secretary of Labor may approve equivalent state plans as a substitute and grant financial support for up to 50 percent of the cost of such safety programs.

Frankly, one of the major reasons the federal government moved into this field is because many states failed to provide modern industrial accident prevention guidelines and the leadership necessary to maintain a high-standard safety program.

We have no such problem in California. Our Department of Industrial Relations has long been recognized as a national leader in the field of occupational safety.

And while it is too early to predict the exact effect the new federal law will have on our program, I have designated the Department of Industrial Relations as the exclusive state agency to administer California's occupational safety and health plan. In this, the department will work with both its own Division of Industrial Safety and the State Department of Public Health which has a related role.

This will provide a single agency through which to examine and develop California's further participation in the federal act.

I believe the protection of our working men and women and the adoption and enforcement of necessary occupational safety standards can be done best in California by our own experts in this field.

Since our own state regulations are superior to federal laws in many other areas of public protection, I am confident that California's plan will more than satisfy the federal standards. But it is important that we receive your support. . . .

*Governor Ronald Reagan
excerpted from his
address to 1971 GISC*

Purpose "To assure so far as possible every working man and woman in the Nation safe and healthful working conditions . . ."

Coverage All businesses engaged in interstate commerce except for the mining and railroad industries (covered by other laws). Special provisions are made for Federal and State government employees.

Employer Duties Each employer (a) "shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees" and (b) shall comply with the occupational safety and health standards and all rules pursuant to the Act except where an approved State plan is in effect.

Promulgation of Standards The Secretary of Labor promulgates occupational safety or health standards. The Secretary must promulgate as soon as practicable (but not later than two years after the effective date of the Act) any national consensus standard or any established Federal standard, unless he determines that such a standard would not result in improved safety or health, and need not hold hearings for the promulgation of such standards. A national consensus standard requires, among other things, that the standard has been adopted by a nationally recognized standards-producing organization under procedures that afforded opportunity for diverse views to be considered and that interested and affected persons have reached substantial agreement on its adoption.

The Secretary of Labor may also promulgate, modify, or revoke any occupational safety or health standard using informal hearing procedures of the Administrative Procedure Act.

The Secretary of Labor must provide for "emergency temporary standards" which are to take effect immediately upon publication in the Federal Register if he determines that (a) employees are exposed to "grave danger" from exposure to substances or agents determined to be toxic or physically harmful, or from any new hazards, and (b) that such emergency standard is necessary to protect employees from such danger. Such standards are to remain in effect until superseded by a standard promulgated under the procedures prescribed in this Act. Any affected employer may apply for variance from such standards promulgated or may file a petition challenging the validity of such standards.

Inspection and Investigation Inspections and investigations are to be made by the Secretary of Labor or the Secretary of Health, Education and Welfare. Both employer and employee representatives have the right to accompany an inspector during his physical examination of the plant. Employees may request an inspection if they believe an alleged violation threatens physical harm or that an "imminent danger" exists. Such inspections may be denied where the Secretary determines that no reasonable grounds exist.

If the Secretary of Labor determines that an employer has violated the "general duty" provision, promulgated standards or rules, or the records requirement, the Secretary must issue a citation in writing for violation with reasonable promptness, but not later than six months following the occurrence of any violation. Each citation issued is to be prominently posted at or near each place of violation. If the Secretary arbitrarily or capriciously fails to seek judicial relief to counteract "imminent danger," any employee who may be injured by reason

of such failure may bring action against the Secretary to compel him to take such action.

Enforcement If the Secretary of Labor issues a citation for violation, he must notify the employer by certified mail of the penalty, if any, proposed to be assessed and advise the employer that he has fifteen working days within which to notify the Secretary that he wishes to contest the citation or proposed assessment of penalty. If the employer notifies the Secretary that he intends to contest a citation or proposed assessment of penalty, the Secretary must immediately advise the Occupational Safety and Health Review Commission. Likewise, if any employee files a notice with the Secretary alleging that the time set by the Secretary for abatement of the violation is unreasonable, the Secretary must immediately advise the Commission. The Commission, consisting of three Presidential appointees, after opportunity for a hearing, shall adjudicate the dispute. The Commission's orders become final fifteen days after issuance unless stayed by court order. Uncontested citations shall be deemed to be a final order of the Commission and shall not be subject to judicial review.

Judicial Review Any "person" (which includes corporations or the Secretary) adversely affected or aggrieved by an order of the Commission may obtain a review of such order in a U.S. Court of Appeals, if sought within 60 days of the order's issuance. The proceeding will not operate as a stay of the Commission's order unless so directed by the court.

Variances Employers may obtain variances from a standard for one-year periods, renewable to a maximum of three years, on a showing of inability to meet standards because of unavailability of personnel or equipment or time to construct or alter facilities. The employer must also have a program for achieving compliance while taking all available safeguarding steps in the interim.

"Imminent Danger" A plant or location can be shut down because of "imminent danger" only by a court order. "Imminent danger" is defined as a condition or practice involving a danger which could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated through the enforcement procedures otherwise provided in the Act.

Penalties Civil penalties are provided up to \$1,000 (a) for each violation and (b) for each day in which a final order is violated. A penalty of up to \$10,000 is provided for each willful or repeated violation of employer duties. Criminal penalties are set for willful violations resulting in death.

State-Federal Relationships The Act places all jurisdiction regarding occupational safety and health under its terms in the Federal government, except for those occupational safety and health issues for which no Federal standard is in effect. A State can assume jurisdiction by submitting a State plan for approval by the Secretary of Labor. The Secretary may have dual jurisdiction in some respects for at least three years after approval of the State plan.

The Act provides for grants to the States up to 90 percent of the total cost to assist them (a) in identifying their needs and responsibilities in the area of occupational safety and health, (b) in developing State plans, (c) in developing plans for data collection, and (d) for experimental and developmental projects. Likewise, grants up to 50 percent of the total cost are provided to assist the States in administering and enforcing programs for occupational safety and health contained in approved State plans.

Two points of view on the consequences of the Federal Occupational Safety and Health Act of 1970 are expressed here by Howard Pyle and George Taylor, in edited versions of their speeches delivered to the Governor's Industrial Safety Conference in Los Angeles on February 18.

Injury prevention needs participation

**Howard Pyle, President
National Safety Council**

It's a privilege to have this opportunity to participate in the opening session of your Governor's Industrial Safety Conference.

I accepted Jack Hatton's personal invitation to join you here this morning not only because I have a great deal of respect for Jack Hatton's accomplishments as chief of the Division of Industrial Safety in California, but also because I believe those of us who have strategic responsibilities in industrial safety and health should speak up now, or forever hold our peace.

Having been deeply involved in the trials and tribulations that have beset the Highway Safety Act since it was signed into law in 1966, I am keenly aware of the kinds of stumbling blocks that can and do inhibit progress for such declarations of national policy as the new Occupational Safety and Health Act of 1970.

It is my contention that the passage of this hotly contested legislation more than justifies the premise I want to emphasize for the next few minutes—"Occupational Safety and Health Are Moving Ahead."

If this sounds like an association of fact you might not expect to hear from the president of the National Safety Council, perhaps this word of elaboration will be helpful.

In principle, the quickest way to summarize our basic philosophy in this regard, as far as safety is concerned, is to refer to one of the closing paragraphs of the testimony we gave before the Congress in connection with the proposed occupational safety and health legislation.

"In all candor, it is the National Safety Council's judgment that there is no real substitute for the effectiveness of the voluntary safety movement for those who participate. Unfortunately, not all participate."

The record shows that where there has been participation, injury frequency rates have averaged more than 70 per cent lower than national rates and severity rates more than 40 per cent lower.

The fundamental reasons for these differences are that those who have successfully managed long-term reductions in rates have made the most of two guidelines in particular.

1. They have recognized that in order to prevent accidents, it is necessary to control the machine, the man and the environment. To control any less than all three leaves a wide gap in any effort to reduce occupational accidents.
2. They have adopted and used the applicable body of loss control knowledge that has been gathered and disseminated by way of the voluntary process since the very beginning of organized safety.



This is not an oversimplification of the case for success in occupational safety, nor is it in any way derogatory to the importance of national standards where both health and safety on the job are concerned.

Occupational safety and health at their best are not going to be handed to us by legislative enactment, or administrative decree. Still, government can bring about changes in these areas of need that would be slow and difficult, if not impossible, by persuasion alone.

It is not likely that federally enforced regulations, as they are now authorized, will improve the injury experience of those who have effective safety programs. In general, these devotees of safety go far beyond that which is enforceable. They are deeply concerned with the selection of personnel, job instruction training, proper methods and procedures to avoid inherent exposure to injury, attitudes, morale and teamwork.

On the other hand, federally enforced regulations *will* move the laggards from little or no safety to more safety. So, the new Occupational Safety and Health Act *will* move occupational safety and health ahead and most commendably.

It covers all businesses engaged in interstate commerce except for the mining and railroad industries which are covered by other Acts. Aside from these two industries, there are no exclusions, no exemptions, and no size limitations.

Each employer will be required to comply with the promulgated standards and rules enabled by the Act and will be required to comply with the general duty clause which prohibits the existence of recognized hazards not covered by promulgated standards.

One of the major controversies was settled when Congress saw fit to give the Secretary of Labor full authority to promulgate occupational safety and health standards. The alternative that was considered was to place such authority with a five-man Presidentially-appointed board. The standards that will be promulgated and enforced are the backbone of this piece of legislation. The law requires the Secretary to promulgate as soon as practicable, but

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Industrial Injuries, labor's national concern



George Taylor, Executive Secretary
Standing Committee on Safety and Occupational Health, AFL-CIO

On December 29, 1970, the Occupational Safety and Health Act was signed into law. On April 28, 1971, this Act, Public Law 91-596 becomes effective.

A great deal lies behind these two simple statements. For the first time in the history of this nation, the United States Government has at last found that work induced illnesses and injuries are a national concern and has adopted a policy and a law to go with it to "assure as far as possible every working man and woman in the Nation safe and healthful working conditions . . ."

Enactment of Public Law 91-596 stands as a great victory for American workers. It culminates the efforts of several years by organized labor, first to obtain serious recognition of the problem by the Executive and the Congress, and to introduce legislation, second, to do all in our power to get an effective bill passed.

The evolution of such legislation is, I am sure, a familiar one to many of you in the audience, particularly those who belong to unions.

First of all, there are indignant denials that a national problem exists and self-righteous assertions that existing institutions are handling its local and state manifestations in a thoroughly effective fashion, just like always.

Then, there is a grudging admission that there might be some kind of a problem, but the role of the federal government should be confined to that of research to find out more about it, and to passing out grants to the states to go on with whatever they were doing. But no standards, no enforcement, no penalties.

After that, the issue becomes not whether the federal government should embark on a preventive and control program, but what kind of legislation should be passed.

The years 1969 and 1970 marked a bitter struggle over this last point—what kind of federal bill. Organized labor believes that its outcome, enactment of PL 91-596, represents the basis for a progressive program. It is comprehensive; it emphasizes prevention; it deals with the complex and worsening problem of occupational health; among other things, it defines rights for workers never before contained in any American occupational safety and health laws; it places the Secretary of Labor squarely in control of the standards and enforcement process, it provides a series of guidelines for the states to participate in the program, and it provides for a standardized national system of reporting occupational deaths, illnesses and injuries for all employments, not only those served by the act.

We are not making any claims that this is a perfect bill. We opposed and still have strong reservations about the independent, three-man Occupational Safety and

Health Review Board which will handle contested enforcement proceedings.

Moreover we urged, but unsuccessfully, for two other features, a single federal program covering all workers, including federal employees, and we also endorsed an equivalent requirement that a state proposing a plan for assumption of regulatory authority under the Act, would be likewise expected to administer its total occupational safety and health program by means of one over-all agency, and to cover all state and local employees.

But since this act is plowing new ground, it is inevitable that operating experience will reveal other needs for strengthening and clarifying amendments, as well as changes in program content itself. This is partially provided for in the provision that three years after the effective date of PL 91-596, the Secretary is required to report to the Congress his recommendations for legislation to remove unnecessary duplications of functions and to achieve better coordination. This does not mean, however, that remedial legislation cannot be acted on before that time, if necessary.

When a President or a Governor signs a bill into law, many people will heave a sigh of relief and say to themselves, "Thank God, that's over. Now let's pass on to the next order of business."

Unfortunately, enactment is merely the overture. Now comes the undramatic but crucial long term effort to make sure that this law is not a paper tiger, but that it actually does do what Congress says should be done—to make the work places of this country fit for men and women to work in safety and health.

The magnitude and complexity of the program that is set forth in PL 91-596 and the problem to which it addresses itself is such that this will require just such a major and continuous effort by all concerned—the Executive and Legislative branches of the United States, state governments, business management and organized labor to harvest the seed that has been planted.

Picture 4 million establishments with 55 million employees, including both agriculture and non-agriculture in every state, the District of Columbia, Puerto Rico and various U.S. dependencies. The number of persons employed range from one, two, or three to many thousand. Sixty percent of these employees are in establishments with less than 500 workers and most are non-union.

The kinds of industries vary from farms to office, to lumbering, to transportation to the heavy mass production sectors such as pulp and paper, automotive, steel, rubber, electric, steel and chemical.

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PYLE—Continued

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not later than April 28, 1973, any relevant national consensus standard or established federal standard. The Secretary need not hold hearings for the promulgation of such standards.

We speculate that the Secretary of Labor will promulgate all of the standards that were promulgated under the Walsh-Healey Public Contracts Act, including the criteria governing noise exposure. This means that virtually every ANSI safety standard, NFPA standard, the Threshold Limit Values adopted by the American Conference of Governmental Industrial Hygienists, and certain standards developed by the Compressed Gas Association and the American Welding Society are prime candidates for promulgation.

Even this voluminous set of standards will not nearly cover all the exposures that now confront many employees. Thus, a great number of standards are yet to be developed for promulgation under this Act. This means that nationally recognized standard producing organizations such as SAE, ASAE, ANSI, etc. have an opportunity for the next two years to develop meaningful standards that will help achieve the purpose of the Act.

Another major controversy was settled when Congress provided for an Occupational Safety and Health Review Commission. This Commission, consisting of three Presidential appointees, is to adjudicate disputes that may arise between the employer and the DOL inspector or the employee and the DOL inspector. The placement of this authority clearly separates the function of promulgating standards from the function of enforcing the standards. Undoubtedly the Review Commission will establish new precedent since it will be their obligation to interpret the standards.

Any person who is aggrieved by an order of the Commission may obtain a review of such order in a U. S. Court of Appeals.

The Act removes the jurisdiction of promulgating and enforcing occupational safety and health standards from the state government to the federal government. A state can reassume jurisdiction by submitting a plan which is approved by the Secretary of Labor. The act provides for grants to the states up to 90 percent of the total cost to assist them in identifying their needs and developing a state plan to meet such needs. Once the state plan is approved, the Act provides for grants up to 50 percent of the total cost to assist the states in administering the plan. The implementation of the state plan will be monitored by the Secretary of Labor.

It can be assumed that the Department of Labor is working with the International Association of Governmental Labor Officials on plans whereby the states will continue their jurisdiction until the Department of Labor is prepared to exercise its responsibility.

There is a unique records requirement incorporated in the law. It requires each employer to maintain and make available to the Secretary accurate records of work-related deaths, injuries, and illnesses except those requiring first aid. It specifically requires recording of those injuries that involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. Another unique feature is that the employer must maintain records of employee exposure to potentially toxic material or harmful physical agents.

It is anticipated that the starting date for keeping injury records under the terms of the Act will be July 1, 1971.

The law provides for HEW to conduct research programs, particularly in the area of occupational health.

Existing standards with respect to occupational illness exposure are woefully inadequate at this time. Therefore, we can expect that a significant number of proposed standards will come primarily from HEW in an attempt to control exposures to occupational illness.

The new Act has a significant impact on product safety. It is indeed the first major product safety bill to be passed by Congress.

Equipment manufacturers will undoubtedly have the obligation to design, manufacture, and deliver equipment in accordance with the standards promulgated under this law. Further, the employer may be required to retrofit existing equipment to bring such equipment into compliance with the standards. Thus, the standards promulgated under the Act will inevitably have a major impact on the manufacturers of equipment that is to be used by employees covered by this Act.

The Occupational Safety and Health Act of 1970 raises the status of occupational safety and health in the Federal hierarchy by creating three new offices or agencies. An Assistant Secretary of Labor for Occupational Safety and Health, the National Institute for Occupational Safety and Health, and the Occupational Safety and Health Review Commission. This institutionalization of occupational safety and health in the Federal structure brings a high level of government endorsement and support to an area of responsibility in which a major cross section of American industry has been pioneering for nearly sixty years. Exemplary progress has been made, but not until now has there been a mechanism in place that will "assure so far as possible every working man and woman in the Nation safe and healthful working conditions."

Certainly no one would argue with this objective.

Still, there are many who are apprehensive about what has been described as the "awesome power" written into the new Occupational Safety and Health Act.

There is no denying that the impact of the Act will be far reaching.

Based on many months of working with the present leadership in the Department of Labor, we couldn't be more convinced that they mean it when they say their administration of the Act will be "prompt, efficient and fair."

If there is an unknown that defies probing, it is the question of whether or not there will be adequate funding, year in and year out.

Over and over we have testified to the effect that

"Simply passing a good law is not enough. Unless the Congress stays with the problem, and year-in and year-out appropriates enough funds to carry out the law effectively, we may even have a regression instead of progress."

Unfortunately, the Congressional track record is not the best in this regard where safety and health are concerned.

As for the National Safety Council—we will not be going out of business. On the contrary, we expect to have more to do than ever and we intend to measure up to our responsibilities in every way.

TAYLOR—Continued

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The kinds of management occupational safety and health programs range from nil to comprehensive, and the same goes for those administered by the various states.

The Departments of Labor and of Health, Education and Welfare are at this point in time ill-equipped to undertake effectively the broad programs provided by the Occupational Safety and Health Act.

Your own State of California had several times more safety inspectors in 1968 than the U.S. Labor Department now employs to enforce the Walsh-Healey, Service Contracts, Longshoremen and Harbormens' and Construction Safety Acts which touch on the job safety and health of at least 29 million workers, let alone what is called for by the Occupational Safety and Health Act.

The Bureau of Occupational Safety and Health within the Department of Health, Education and Welfare has more specialized, technically skilled personnel than Labor, but is likewise handicapped by an inadequate budget, no history of engaging in any enforcement program, being constantly in danger of losing its identity and mission as a result of constant reorganizations, and never having been given statutory existence.

It has become quite clear to organized labor over the course of three administrations, including this one, that the Secretaries of HEW have had about the same awareness of the existence and significance of the Bureau of Occupational Safety and Health as they would have of the puberty rites of the Shan tribesmen of upper Burma.

Winning a battle isn't winning a war and winning an Act isn't winning a program that puts the flesh on the bones.

I'll put it bluntly. It was organized labor and enough men of good-will in the Congress, with the help of some of our friends among the scientific community that made this Act possible.

It will be organized labor which will continue to bear the brunt of seeing to it to the best of our abilities and efforts to make it work the way it is intended.

Business management has been relatively quiet at this moment, but if the early operational history of the Coal Mine Safety Act is any indication, elements of industry will be probing for the weak places, testing them in the courts, using procedural delays and most certainly not appearing before appropriations committees of the Congress urging that adequate funds be appropriated to operate the program. The same statement can be made with respect to the governors of the various states.

The 120 days between the signature of the President and the effective date of this Act on April 28, 1971 can be crucial. Either we have the beginnings of a real program to save lives, to reduce occupational illnesses or injuries, or there will be a great deal press agentry, nothing of substance and no drop in the number of workers injured and made ill on the job.

The AFL-CIO is working on the not unreasonable assumption that this law was passed with serious intent, and now that the cries of agony from the victims of the unsafe and unhealthy workplace have finally been heard after generations. We are also resolved that PL 91-596 will not have the same unfortunate beginnings as the Coal Mine Safety Act of 1969. Labor has these inescapable responsibilities:

1. To fight for enough money appropriated by the Congress to begin and continue a significant program.
2. To see to it that the manner in which the Secretaries of Labor and HEW intend to carry out their responsibilities is the best way of doing it.
3. To see to it that the program gets enough manpower, skilled and trained manpower, to get the job effectively done.
4. To see to it that adequate standards are promulgated and firmly enforced.
5. To see to it that our unions from the plant level up will undersand and use effectively the provisions of the bill that define and protect their rights and set forth their obligations.
6. To review collective bargaining provisions in contracts to gain inclusion of strong occupational safety and health clauses.
7. In states whose safety and occupational acts need modernization in order to qualify them for participation in this Act, to support actively legislation to do this.

One way of determining the real concern over worker safety and health of this or any other national administration is the kind of persons they appoint to key positions.

These include a new Assistant Secretary of Labor for Occupational Safety and Health; the Director and Assistant Director of the HEW Institute for Occupational Safety and Health; the three member Occupational Safety and Health Review Commission; and the National Advisory Committee on Occupational Safety and Health.

We are concerned about appointments to these posts. Two recent experiences give rise to such concern.

Last fall, the President proposed five persons to man the Enforcement Board of the Metallic and Non-Metallic Mine Safety Act, administered by the Secretary of the Interior. The breakdown was two management, two labor and one "public". One of the management appointees was vice-chairman of the National Right-to-Work Committee; one of the so-called "labor" representatives was a retired mine management man who had been a one-time union member; the other labor representative was president of a company union. The AFL-CIO and the Steelworkers protested strenuously, and the names were withdrawn.

A few days ago, the resignation of Undersecretary of Interior Fred J. Russell was demanded by West Virginia Congressman Ken Hechler for "flagrant violations of the law" while acting Secretary in the appointment of 7 unqualified persons to a 13 member technical advisory board on research under the Coal Mine Safety Act. One is a former airline stewardess, two have been Republican County Chairmen; one is a physician's widow who has just joined the staff of a Republican Senator from Oklahoma; one a retired grain executive whose company operates a salt mine in Louisiana which was the scene of a disaster killing 21 men in 1968, and one is vice president of the coal company whose Farmington, West Virginia, property took the lives of 78 miners in 1968.

Secretary Hodgson a few days ago announced a major goal of his department as that of improving the work environment. A good way of demonstrating the admin-

istration's immediate determination is by the kind of men who are appointed to top positions under the Act.

The State of California has pioneered in social legislation and its occupational safety and health laws which organized labor in your State had a dominant part in establishing have been among the two or three best in the nation. As a matter of fact, the data on occupational illnesses used by the Federal Bureau of Occupational Safety and Health in projecting national figures was based on statistics gathered systematically by the California Bureau of Occupational Health and Environmental Epidemiology.

I am disturbed, however, to read the 1969 testimony of John Henning in the San Francisco field hearings on the federal occupational safety and health bills, who stated that there are fewer safety inspectors now than previously and that since 1966, the program budgets have suffered badly, with the result that enforcement is accordingly less effective.

I have mentioned that PL 91-596 establishes eligibility criteria which must be met by a state which desires to assume the enforcement authority set forth by this Act.

Those of you who are union members should consider these workers' rights which are provided by the Occupational Safety and Health Act, and use them as a sort of a check list against your state laws.

1. Workers must be kept advised by the employer by posting notices and other means for their protection and obligations, together with required posting of applicable standards.
2. Workers have the right to obtain the histories of their exposure to harmful materials, the right to observe monitoring and measuring, access to records, and the right to be notified by management of overexposure to toxic materials or physical agents.
3. The accredited worker representative for the purpose of aiding such inspection has the right to accompany the inspector when he makes his rounds of the establishment.
4. The accredited worker representative may request the Secretary in writing for a special inspection, if he feels that there is a situation threatening physical harm, or that there is an imminent danger. He must set forth the particularities of the alleged situation, and his name is kept confidential. If the Secretary finds no grounds for the request, he must notify the representative of his determination.
5. Any employee or accredited worker representative may notify the Secretary or one of his inspectors prior to or during an inspection of any violation of the Act which they believe exists. If the inspector refuses to issue a citation, the Secretary must furnish the complainant the reasons for such refusal in writing and establish informal procedures for reviewing the decision.
6. Posting of citations near the place of the violation is required.
7. The worker representative or union can seek and obtain the right to intervene in contested hearings before the Occupational Safety and Health Review Commission, and are provided with recourse to the Federal appellate courts.
8. Any discrimination by the employer against any employee because of any exercise of his rights under the Act is prohibited, and the employee has

a right to petition the Secretary on alleged discrimination. If the Secretary finds a violation of this section he can obtain relief for the worker in the federal courts—including rehiring, reinstatement in his former job and back pay.

9. If the Secretary arbitrarily and capriciously fails to invoke the imminent danger section of the bill, the employee or union can bring action against the Secretary in the federal district courts.
10. Workers or their unions can request the Secretary of HEW to determine the toxicity of any substance used in the job environment.
11. Workers have the right to obtain from the Secretary of HEW such data and information as the Secretary may have concerning criteria dealing with harmful effects of substances, data on research on new problems, data on special monitoring and measuring of harmful substances which have not yet been set under a standard, the Department's list of toxic substances and their harmful concentrations.

It is my understanding that efforts to amend your state safety law to allow workers to request special inspections was vetoed. The question now arises as to whether a proposed amendment to your act incorporating these rights relative to your own state departments in order that California can participate in this Act would or would not meet the same fate.

In 1969, Governor Reagan wrote in his comments on the proposed Occupational Safety and Health bills, that "The idea of encouraging wider participation among the states is commendable . . . There is some feeling in our Department of Industrial Relations, however, that the bill could be interpreted to the disadvantage of active states like California should there be a desire by a later administration to bring industrial safety under federal control."

I would assume then that there is at least in this area of viable state-federal relationships that there is a situation of rare agreement between the California State Federation and the Governor. John Henning's testimony made it clear that the Federation did not endorse abolition of state safety systems, but that all workers will have equal protection of a federal law even in a state where laws and programs are inadequate. California has a good base to start with even though that base appears to be eroding. By appropriate amendments to your laws, California can effectively meet the requirements of the Federal Act, and with an adequate budget carry out an effective program.

In conclusion, there is great hope, but many problems in this Act designed to provide a majority of the nation's workers with a decent safe, healthy place to spend 25% of their producing lives.

Once again I emphasize the responsibilities of the AFL-CIO and its affiliates, from the plant level on up to make this bill work, and go about it intelligently, using the rights it provides for us, but at the same time living up to our responsibilities to work safely.

If we do our job, if the Federal and State governments do theirs, and if business management as a whole realizes that it is dollars and cents in their pockets to reduce occupational illnesses and injuries, then this Nation may well be taking one step further toward long delayed social and economic justice for its workers.

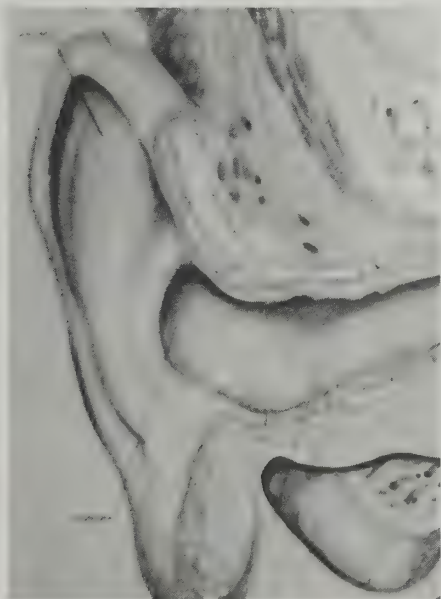
Controlling noise in workplaces

**William W. Steffan, Senior Health Physicist
Environmental Engineering Unit, State Division of Industrial Safety**

Noise is unwanted and discordant sound, and it can be annoying. Prolonged exposure to excessively high noise intensities can also impair hearing. To prevent hearing loss among workers, California's Noise Control Safety Orders set up standards to control industrial noise and exposure to it.¹

Compliance with the standards limits exposure to noise that might cause temporary or permanent hearing loss. Hearing may be impaired in many other ways, of course, like the following which are unaffected by the noise standards:

- plugged ears caused by wax, infection, or some foreign body;
- middle ear damage from infection or calcification;
- inner ear nerve damage from disease, dietary deficiency, high fever, head injuries, or drug and chemical reactions.



¹ California's revised Noise Control Safety Orders became effective on September 19, 1970. These regulations are consistent with the recommendations of the American Conference of Governmental Industrial Hygienists and the Safety and Health Standards for Federal Supply Contracts (Walsh-Healey).

Identifying a Noise Problem

There are clues that indicate workers are being exposed to excessive noise. Some danger signs of a noise problem are:

- temporary hearing loss and muffled speech;
- ringing or similar noises in the ears after leaving the work area;
- difficulty in hearing speech in the work area.

Any of these symptoms of excessive noise exposure would indicate that a noise survey should be made under the Noise Control Safety Orders.

Noise problems might also be indicated (1) by audiometric tests of employees showing hearing loss or (2) by spot noise surveys, made by the staff of the State Division of Industrial Safety or by industrial hygienists of a public health department.

Making a Noise Survey

Once a noise problem is identified, the first step in evaluating that problem is to make a noise survey. The employer should make the survey, as covered by Section 3871 of the Safety Orders. The State Division of Industrial Safety does not have a large enough staff to perform complete noise surveys.

A noise survey must do two things. First, it must identify the equipment creating the noise and how much each machine contributes to total noise; and second, estimate how long each employee is exposed to the various noise levels above 90 dBA so their exposure can be calculated.

With sources of noise identified, then the employer can reduce noise levels through engineering controls; or he can remove noisy equipment so that fewer workers are exposed; or he can replace the equipment.

Standards in the Noise Control Safety Orders are based on the dBA scale of noise levels, and noise surveys and records of these surveys relating to human exposure, must be reported in dBA. A survey can be made with an octave band analyzer that does not have an "A" scale and the data then converted. The best method for converting octave band data to dBA is to add the proper filter attenuation value to each octave band and then add these new octave band values logarithmically to obtain the single dBA value.²

² Handbook of Noise Measurement, 6th Edition, General Radio Company, A. P. G. Peterson, E. C. Gross, Jr., pages 57-59.

GROUP 6.1. NOISE CONTROL SAFETY ORDERS

Article 55. Standards for Occupational Noise Exposure

3870. Purpose. Article 55 sets up standards for the control of and exposure to industrial noise in order to contribute to the conservation of employees' hearing. Daily exposure for the times and noise intensities specified represent conditions under which nearly all workers may be exposed throughout their working years without causing permanent hearing loss sufficient to affect their ability to hear and understand normal speech.

NOTE: Authority cited: Sections 6312, 6500 and 6502, Labor Code.

History: 1. New Article 55 (Sections 3870 through 3872) filed 2-13-63; effective thirtieth day thereafter (Register 63, No. 3).

2. Repealer and new Article 55 (Sections 3870 through 3874) filed 8-20-70; effective thirtieth day thereafter (Register 70, No. 34).

3871. Surveys. Whenever noise levels have been demonstrated to exceed those sound levels in Table I, the employer shall make or cause to have made noise evaluations to determine the magnitude of exposure to employees. Such records shall be maintained and made available to the Division.

3872. Allowable Exposure.

(a) Intermittent or Continuous Noise,

Table 1

Total Exposure Time Per Day, Hours	Sound Level dBA
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
¾	110
½ or less	115

NOTE: Sound levels shall be measured with a sound level meter which meets the ANSI S1.4-1961 Specifications for General Purpose Sound Level Meters standard or equivalent, set on the A scale and slow response. Noise exposures at different levels are combined by adding the fraction of the allowable time used at each exposure. The sum of such fractions should not exceed unity. For example, if an exposure consisted of 1 hour at 100 dBA (allowable 2 hours) and 3 hours at 90 dBA (allowable 8 hours) and 4 hours at less than 90 dBA (no limit) the sum of the fractions of the allowable time used would be $\frac{1}{2} + \frac{3}{8} + 0 = \frac{7}{8}$. Since this is less than 1, the allowable exposure is not exceeded.

(b) **Impact or Impulsive Noise.** Exposure to impact or impulsive noise shall not exceed 140 dB peak sound pressure level.

NOTE: Peak sound pressure levels shall be measured with an instrument having a rise time of 50 microseconds or less (for square waves) and which will measure and display the sound pressure level within 1 dB of the true peak.

3873. Engineering Control of Noise. Whenever the operations reasonably permit, exposures to excessive noise shall be eliminated or at least reduced by engineering or operational controls. When such exposures are not reduced to allowable levels specified in Section 3872, a continuing effective hearing conservation program shall be administered.

3874. Personal Protective Equipment. (a) **When to Be Worn.** Whenever the exposure to noise exceeds the levels given in Section 3872, the employer shall provide and the employees shall use acceptable ear protectors. (For the purpose of these Orders, "acceptable" means acceptable to the Division.)

(b) **Education in Use of Equipment Required.** The employee shall be informed of the locations where the wearing of ear protectors is required and shall be instructed in the use of such ear protectors.

(c) **Provision and Care of Equipment. Duty of Employer and Employee.** It shall be the duty of the employer to provide such ear protectors as may be required and to replace them when necessary. It shall be the duty of the employee to properly use such equipment provided for him and to exercise due care to keep same in efficient and sanitary condition.

What Are Allowable Exposures?

Allowable exposures for intermittent or continuous noise are specified in Table I, Section 3872 of the Noise Control Safety Orders. It is permissible to interpolate the data on allowable exposures. For example, if after all practical efforts to reduce the level the noise level is still 91 dBA and the time is 7 hours, then that exposure would be allowable. Extrapolation is not allowable for short exposures above 115 dBA. The criteria in Table I is based on the fact that short daily exposures are usually intermittent, this assumption is reasonably safe if the sound levels are between 90 dBA and 115 dBA; however, extrapolation above 115 dBA might result in harmful exposure.

It is not necessary to extrapolate the data in Table I for daily exposures of more than 8 hours or to record noise exposures below 90 dBA. If such extrapolations are desired, then it is proper to permit exposures at 87 dBA for 16 hours and at 89 dBA for 10 hours, in accordance with the equal energy concept (or a 3 dB increase when exposure time is cut in half).

The Second Intersociety Committee on Guidelines for Noise Exposure Control are shown in Table A.

You can see that in preparing Table I of California's revised noise control regulations, daily noise exposures of an hour or less were assumed to occur in 7 or more intermittent exposures evenly distributed throughout the day. For longer exposures that accumulatively total more than 4 hours in a day, the noise was assumed to occur in 3 separate exposures. The damage from a single exposure to noise follows the equal energy concept (or a 3 dB increase when exposure time is cut in half).

What About Impact or Impulsive Noise?

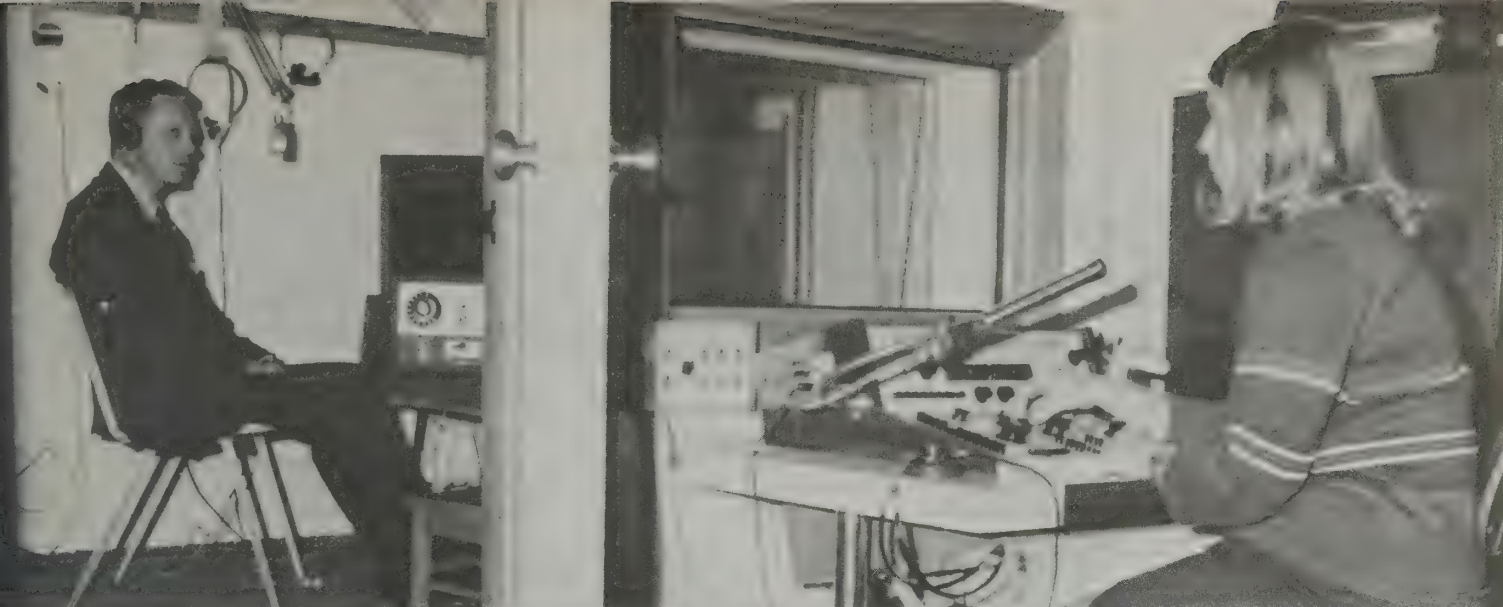
Considerable hearing loss can result from impact or impulsive noise. Impact noise frequently occurs where the ambient continuous noise exceeds the levels in Table I of the Noise Control Safety Orders. If ear protectors are worn because of the continuous noise, surveys of the impulsive noise will not be required in most cases.

If impulsive noises occur close together and are of such duration that a sound level meter set at slow re-

Table A
ACCEPTABLE EXPOSURES TO NOISE IN dBA
AS A FUNCTION OF THE NUMBER OF
OCCURRENCES PER DAY

Daily Duration		Number of Times the Noise Occurs Per Day						
Hours	Min.	1	3	7	15	35	75	160 up
8	—	90	90	90	90	90	90	90
6	—	91	93	96	98	97	95	94
4	—	92	95	99	102	104	102	100
2	—	95	99	102	106	109	114	
1	—	98	103	107	110	115		
30		101	106	110	115			
15		105	110	115				
8		109	115					
4		113						

To use the table, select the column headed by the number of times the noise occurs per day, read down to the average sound level of the noise, and locate directly to the left in the first column the total duration of noise permitted for any 24-hour period. It is permissible to interpolate if necessary. Noise levels are in dBA.



Validity of audiometric tests is assured when conducted in this kind of controlled environment, with the subject in a sound-proof room. (Photographed at the San Francisco Hearing and Speech Center which also supplied other photographs shown here.)

sponse on the "A" scale measures above 90 dBA, the noise must be considered "continuous" or "intermittent," and the exposure limits in Table I of the regulations must be applied.

Using the sound level meter to estimate impact noise peaks is not accurate. For example, a steam drop-forge measuring 142 dB peak would cause the needle of a sound level meter to move about 5 dB off the pin when it was set at 130 dBC at fast response; however, an outdoor firecracker measuring 142 dB peak would cause the sound level meter needle to move off the pin 5 dB when set at only 110 dBC at fast response.

It is desirable to reduce vibrations in equipment and reverberations from hard surfaces so the impact noise pulse is kept as short as possible. Most damage risk criteria are based on studies of gunfire, both indoors and outdoors. Duration of noise from outdoor gunfire is short, usually less than a millisecond, while gunfire noise indoors lasts relatively long, perhaps 100 milliseconds or more, and is like many industrial impact noises.

The NAS-NRC Committee on Hearing, Bioacoustics and Biomechanics, in a report entitled Proposed Damage-Risk Criterion for Impulse Noise (Gunfire), concluded that exposure to 100 impact noise pulses per day, lasting 100 milliseconds each, should be limited to 140 dB peak pressure level. Exposure to 10 pulses per day should be limited to 145 dB. Even more important, if the duration of the pulse is reduced to 1 millisecond, the NAS-NRC Committee would permit one hundred 157 dB peak pulses per day.

In applying the "pulse duration" criterion, the duration of pulse and the magnitude of the peak must both be known. However, it is difficult to measure very short-rise time pulses, and even the physical laws commonly used to relate sound pressure to sound power are not valid. The above report on gunfire emphasizes that it would be desirable to damp the vibrations in impulsive noise equipment and reduce reverberations from the surrounding building to keep noise pulses as short as possible.

The most straightforward way to identify an impulsive noise problem is to measure the hearing threshold of a few individuals before they start work and after a few hours of exposure. If their hearing threshold at 2000

Hz and 4000 Hz shifts more than 15 dB, there is a noise problem. Because of varying sensitivity for each individual, it is desirable to average the tests of 30 individuals (who have minimal hearing loss); or to average the tests of 10 people on 3 different days. This method directly answers questions about potential damage from impulsive noise. It also effectively bypasses the need for tests of the pulse characteristics, instrument response, or biological responses to various pulse shapes. Selectively measuring hearing thresholds also can test the effectiveness of engineering controls and ear protectors.

What About Engineering Controls?

Section 3873 of the Noise Control Safety Orders requires that noise levels be reduced as much as practicable by engineering controls. The goals are removal, redesign, or isolation of noisy equipment. The short-range objective is to minimize the number of people who must wear hearing protectors and the time they are exposed to excessive noise.

What is a continuing effective hearing conservation program as specified in Section 3873? The program, first of all, commits management to long-range efforts to eliminate a plant's excessive noise levels and to conserve the hearing of employees by the use of hearing protection devices until excessive noises are eliminated. Management should assign responsibility for such a program to an effective administrator who can coordinate with purchasing, maintenance, health and safety, engineering, manufacturing, and others involved in noise control. He should keep records of noise surveys, cause such surveys to be made as necessary, and develop methods to show the effectiveness of his program. He should provide consultants on hearing conservation with specifications for new equipment, design changes, and other engineering controls.

Audiometric tests, among others, are useful to determine permanent hearing loss in new employees and to measure possible deterioration of their hearing over time. But care must be used to avoid several common errors that invalidate the data. For example, companies have accumulated years of hearing test data on employees who are tested during the work day immediately after coming from noisy jobs. Some of these employees, prob-

ably, have temporary hearing loss due to the recent exposure.

To make sure that only permanent hearing loss is measured, the employees must not be exposed to excessive noise for 16 hours prior to the test. If an employee with a bilateral hearing loss claims to have been exposed, repeat the test at a later date.

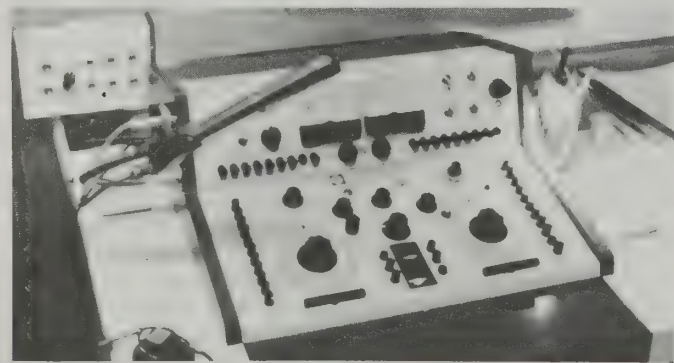
Individuals with good hearing must be tested in a very quiet environment so that ambient noise does not mask their threshold of hearing. Audiometric tests are expensive, and every effort should be made to assure their validity.³

What About Personal Protective Equipment?

When a determined effort does not reduce the noise to a safe level, employees must wear acceptable ear protectors to conserve their hearing until noise exposures can be further reduced. The State Division of Industrial Safety publishes attenuation ratings of devices which have been tested by independent laboratories in accordance with ASA Z24.22-1957 Standard Method for Measurement of Real-Ear Attenuation of Ear Protectors at Threshold. Division engineers examine ear plugs to see if a blow to the side of the head is likely to cause overpressure or otherwise damage the eardrum. Devices made of newly developed materials must be tested for irritating or allergenic reactions. A comfort test would be desirable; however, enough varieties are available so that "testing in the market place" probably eliminates uncomfortable devices.

The reported attenuation is usually "optimized" by the testing laboratory. Most plugs come in various sizes, but ear canals come in various shapes as well as sizes. If the testing laboratory selects listeners for "best fit," as permitted in the Standard, or if over-sized plugs are forced into flat ear canals, the average attenuation can be increased substantially. The "average" employee who selects a comfortable plug will get less attenuation than the testing companies' "average listener." To assure that all employees are adequately protected, about 10 dB should be subtracted from the attenuation values attributed to each device. Fitting should be done by a trained person; and employees with flat ear canals should be provided with muffs or individually molded plugs. Most of the plugs listed in the Division's published ratings are

³ A complete discussion of audiometric testing methods, including 4000 Hz screening, is in the "Measurement of Hearing" section of the 1969 revision, Guide for Conservation of Hearing in Noise, American Academy of Ophthalmology and Otolaryngology, 15 Second Street, S.W., Rochester, Minnesota 55901.



good for noise fields up to 105 dBA even with 10 dB subtracted.

Plugs should only be worn during exposure to excessive noise. They should be washed in warm, soapy water before each use, and when not in use, should be kept in a clean, dust-tight container. They should not be worn from person to person without thorough sanitization.

Protective ear muffs are somewhat simpler devices to fit, although they can create fitting problems for those who wear glasses, heavy sideburns, or long hair. Glasses with narrow temples can be worn with a good seal, as well as long hair and sideburns if kept from under the seal. The combination of heavy sideburns and glasses may be too much to cope with, however.

Tests of hearing protectors rate them for average attenuation at several frequencies, and give the standard deviation from the average. The standard deviation is a measure of the variability in results among the group being tested. The variability of attenuation for the ordinary user who is properly fitted should be about the same as stated by the testing laboratory. Typically, the standard deviation is about 5 dB; for example, if the average attenuation is 25 dB, it may be written 25 ± 5 dB. This means that half the persons tested had 25 dB or more attenuation, about 85 percent had 20 dB or more attenuation, and 98 percent had 15 dB or more attenuation.

Because of this built-in variability, persons exposed to high noise levels and who need most of the listed attenuation of the ear protector should have their hearing checked to make sure they are adequately protected. A quick and inexpensive check is the screening test at 2000 Hz and 4000 Hz made as quickly as possible after exposure to the noise (2 minutes is one standard). If the average change in threshold at these two frequencies exceeds 15 dB, the hearing protectors are probably not effective. Such biological screening tests can be useful as a check of environmental controls. A change in the permanent hearing acuity of 10 dB, however, may indicate medical problems and should be reported to a physician.

The American Medical Association and the American Academy of Ophthalmology and Otolaryngology suggest the following criteria to distinguish normal from abnormal hearing, especially for medical referral:

If a preplacement audiogram shows an average hearing loss of more than 15 decibels at 500, 1000, and 2000 cycles per second⁴ by averaging the decibel scores from these frequencies, the employee should be referred to a physician for an otological examination. Such referral is also advised for employees whose audiograms show an unusual irregularity or abrupt loss beginning at 2000 cycles per second.

As a general rule, a person who works on a noisy job for 30 years without protection will experience about $\frac{3}{4}$ of the expected noise-induced loss in the first 10 years and only about $\frac{1}{10}$ during the last 10 years. Continue to employ the occupationally deafened. As part of the vocational rehabilitation program, noisy jobs should be given to the hard of hearing when feasible. Often their other senses have been sharpened. They make good workers in noisy jobs, and they can better survive such an environment. Of course, their remaining hearing must be conserved.

⁴ California also includes 3000 cycles per second.

Take the slip out of working surfaces

**William J. Wilson, Jr., Safety Engineer
State Division of Industrial Safety**

We need to look down more often and pay attention to the floors we work on, walk on, and slip or fall on.

The entertainment industry has made the slip or fall such a laughable part of slapstick comedy, that we may tend to forget how dangerous these simple mis-steps can be.

Accidents on "working surfaces"—including the office or factory floor—claim about 25,000 injured each year in California workplaces. There are also several deaths annually due to slips or falls at work.

The dollar loss incurred under Workmen's Compensation may run as high as \$15 million a year for these kinds of work accidents.

Accidents on "same-level working surfaces" do not necessarily all occur on floors. "Working surfaces," as defined by the State Division of Labor Statistics and Research, group together floors of factories, hotels, and hospitals with "working surfaces" for highway patrolmen, park rangers, and highway construction crews, to cite only a few examples. Nevertheless, the agent for the greatest number of all disabling injuries is the "working surface," the statisticians report, and the greatest number of these injuries occur on floors.

Clean Away Floor Litter

The first step to prevent falls or slips on work surfaces is a conscientious housekeeping program. On any surface, no matter how well maintained, accidents must happen when litter or foreign matter accumulates. Spilled liquids, paper clips, silicone spray lubricant, and furniture oil can contribute to slips unless cleaned up.

To keep surfaces clear of foreign matter, many workplaces require frequent sweeping or dust-mopping, usually once a day but oftener in well-traveled areas. Good housekeeping also requires spot-mopping of spills, and where this is common, janitors are on immediate call. Vinyl, cloth, or rubber mats at doorways also reduce the hazard of slips. Foreign matter on soles or heels of shoes tend to scrape or fall onto the mats; and in wet weather the mats also help dry the bottoms of footwear.

Routine cleaning also helps prevent falls or slips. This is effective even with only the usual nightly dust mopping and damp-mopping.

Importance of Floor Maintenance

Floor maintenance figures as importantly as cleaning in accident prevention. Some floors, like marble, need no special treatment. Terrazzo, however, must be treated with a sealer that is occasionally reapplied and then main-



tained like marble. Some firms apply a neutral cleaner on terrazzo floors once or twice weekly. Resilient floor coverings like vinyl, asphalt, or rubber tile and linoleum need more attention. They are commonly treated with wax or a synthetic floor finish, then retreated at varying intervals. In retreatment, old finish is stripped off and new finish applied and buffed, if necessary.

Maintenance programs may vary, but all follow some set pattern of retreatment, usually every 30 to 65 days. Some firms retreat when the volume of traffic requires or as indicated necessary by slipperiness tests.

The degree of slipperiness may depend on the floor finish used in maintenance programs. Solvent base, or



paste, waxes are most widely used on wooden floors. Water emulsion waxes in a 12 percent concentration are generally used on office floors and on corridor floors with normal to light traffic. Areas of heavy traffic may require a 16 percent concentration. Waxes are buffable and produce a hard, glossy finish, especially those containing Carnauba. Polymer finishes provide the desirable characteristics of waxes but with greater slip resistance. Buffable polymers are a mixture of wax-like and resinous materials, though containing mostly the softer wax-like substance. Non-buffable polymers contain mostly resins which form a rigid, non-polishable film that has a tendency to powderize under traffic. Both types provide comparable slip resistance. Maintenance supervisors at many large public buildings use the shot-bag test to learn a floor's coefficient of friction. This consists of pulling a ten-pound bag of shot across a floor. A spring scale attached to the bag registers the pounds of pull. That number divided by ten equals the coefficient of friction. Floor maintenance people generally agree that a coefficient of friction of 0.3 or higher indicates a safe floor. Some will accept 0.275. The State of California requires a slip resistance coefficient of not less than 0.26 for water emulsion floor finishes. The State also requires Underwriters' Laboratories approval on all finishes.

Underwriters' Laboratories no longer uses the term "approved" but classifies floor finishes as to slip resistance. Companies that qualify for the classification must agree to use the UL markings only on products that are classified and comply with UL requirements. These products must have a slip resistance characteristic of not less than 0.5, as determined by the static friction test method of UL. Results of static friction tests are not directly comparable with those of the shot-bag test which measures kinetic friction. Static friction always exceeds kinetic friction; consequently, floor finishes carrying UL "approval" may test out with a slip resistance coefficient, as applied on a floor, of only 0.3 or even less.

Application Also Important

Even though a floor finish has an acceptable coefficient of friction, the method of application and degree of care could affect it to the point of producing a slippery surface. The people who perform the floor maintenance jobs are often unskilled and fail to adhere to

manufacturer's directions. Most modern liquid finishes have good leveling qualities, but unevenness can result if too much material is applied, if improper equipment is used, or if insufficient drying time is allowed before buffing. This will also be the case if the floors are not completely and properly stripped prior to application of the finish. Treated floors which are improperly or inadequately buffed will be slippery. The frequency of buffing depends to a great extent on the amount of traffic but if neglected when necessary, results in an unsafe condition. Poorly rinsed floors following washing with soaps present a great hazard.

Spray buffing has considerable merit, because it keeps a thin film on an initially well-prepared surface. At the start of a spray buffing program, the floor must be thoroughly stripped of all the previous finish. It is then sealed with one or more coats of a self-polishing finish. From this point on, as long as spray buffing is properly done, the floor will not require stripping and recoating for an extended period of time, perhaps a year. The spray buffing consists of spraying a dilute floor finish mixture in mist form on the floor and buffing immediately. This process cleans the floor as it applies the extremely thin coat of polish. Significant savings in the overall floor maintenance expenditure can be realized since spray buffing is a fast operation, it need be repeated only as required, and due to the thin coat, it is possible to patch and blend worn and high traffic areas without redoing the whole floor surface.

A crystal-clear, water-base polymer finish is currently being field tested in two Federal buildings in Sacramento, using the spray buffing maintenance process. This product contains 18 percent solids in contrast to the average 12 percent of the normally used finish, and can be used on any type of flooring except wood. The quarry tile corridors in one of the Federal Office Buildings in San Francisco are treated with this material, and they are brilliant to the point of having a wet appearance; yet they have remarkable slip resistance. These floors were initially stripped and sealed with this particular finish. Maintenance since then has consisted merely of daily dust mopping and spray buffing with the same finish as required. It is felt that stripping and retreating may not again be needed. The cost of this material is about three times that of the ordinary finishes, but the savings gained in labor and materials by the reduction, or possible elimination, of retreatment more than offset it.

From an economic point of view, the cost of materials is a minor item in a floor maintenance operation. According to those spoken to in this study, labor averages 90 to 96 percent of the total cost. Therefore, advantage should be taken of equipment and materials which speed up the operation and produce a longer-lasting finish. This is entirely feasible since these benefits are obtainable without sacrificing slip resistance.

In summary, slips and falls on floors can be controlled by proper floor maintenance, so it behooves building managers to establish and continue adequate floor maintenance programs. Floors should be kept free of foreign matter. Washing solutions should be thoroughly rinsed from the floors after use. Floor treatment materials should be properly applied and maintained. Buffing and retreatment should not be neglected when required. Improved slip resistance, as well as attractiveness and durability, can be obtained by employing the spray buffing method of floor care along with a good polymer finish.

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For Safety's Sake

The State Industrial Safety Board finished preliminary hearings on the proposed new High-Voltage Electrical Safety Orders, and their adoption will be considered early in June. The proposed orders are the result of more than six years of effort by a DIS committee representing all segments of the electrical industry. E. E. Carlton, supervisor of the DIS electrical safety section, reports the new orders are essential in providing safety standards for work procedures, as higher voltages have become more widely used in industry. At the same time, dangers to workers exposed to these installations have increased. Accident statistics show, according to Carlton, that more workers are killed on circuits exceeding 600 volts than on low voltages. An article by Carlton on high-voltage dangers will be published in a forthcoming issue of the trade journal, "Underground Power Technology".

"No man has done more to help the cause of industrial safety in California," and with that praise, Jack F. Hatton, Chief of the State Division of Industrial Safety, presented the DIS Service Award to the veteran labor leader. Marr is vice president and safety representative of Local #3 of the Operating Engineers Union in San Francisco. Hatton called him the kind of leader "who not only believes in on-the-job safety, but who preaches, practices, and actively promotes it."



Arthur Snyder, supervisor of the pressure vessel safety section in the State Division of Industrial Safety, was honored by the ASME (American Society of Mechanical Engineers) at their annual meeting in Miami, Florida, early in May. Snyder will receive a Certificate of Merit for outstanding service to the industry. The long-time DIS safety expert represents California on the National Board of Boiler and Pressure Vessel Inspectors. He also helped with resource material on earthquake hazards for boilers and pressure vessels, presented at the National Congress on Pressure Vessels and Piping in San Francisco May 10-12.

Farm equipment sometimes needs to travel on public roads, but these lumbering rigs pose a danger to others traveling at normal highway speeds. To overcome this danger, the law requires these slow-moving vehicles operating on the State's highways at 25 miles an hour or less to display a special emblem on the rear of the vehicle. It is a triangle with squared corners, the center, fluorescent orange, and the borders, reflective red. The new sign is said to be recognizable at 600 to 700 feet by motorists approaching from behind at speeds up to 70 miles an hour.

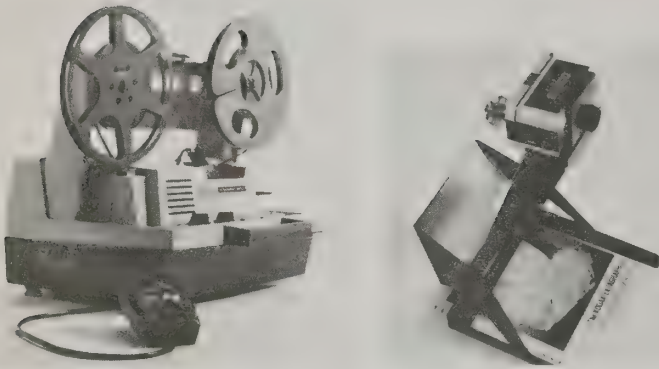


Orval Thogerson, veteran carpenter for the Williams and Burroughs Construction Company, can thank his hard hat for the fact that he is still able to work. A hammer dropped from the top of the W & B high-rise project in Mountain View hit Thogerson right on his hard hat. It took quite a dent but the carpenter was unhurt. Bob Locklin, W & B job site supervisor, described the incident as unusual for the safety-conscious company, but certainly proved the wisdom of common-sense safety precautions like hard hats, even at the best-run jobs. J. H. Russell, senior construction safety engineer of DIS (at left in photo), took part in presentation of a Turtle Club award to the safety-headed Thogerson (right). Bob Locklin is at rear.



The U.S. Forest Service and the State of California have ratified an agreement for administration and inspection of ski lift facilities. The pact reaffirms California's primary responsibility for safety inspection of about 85 percent of all ski lifts in the State, according to Ray Rodriguez, supervisor of the DIS elevator safety section. Affected by the pact are lifts at 36 ski areas located on U.S. Forest Service land in California, and patronized annually by about 2.5 million winter sports enthusiasts. The remainder of the 15 percent of ski lifts not affected by the pact are located on other than U.S. Forest Service land and are already fully covered by State inspection. D. R. Leisz, U.S. Forester for the California region, termed the new cooperative inspection program mutually beneficial, particularly in its reliance on the "generally recognized excellent ski lift inspection program in California", he said. Rodriguez reported that the Association of Recreational Tramway Authorities is devoting its efforts to a proposed code that would allow uniform safety standards for aerial passenger tramways if adopted in all states. Rodriguez is chairman of the ARTA standards committee.

The Division's safety orders governing use, manufacture, and handling of explosives (mainly blasting) were updated by State Industrial Safety Board action in December 1970. Explosives, widely used in various industries like mining, logging, and quarrying, in the past had been treated separately and inconsistently in several safety orders. The Division's explosive safety orders, with limited exceptions, are now accumulated in one place as a part of the General Industry Safety Orders . . . The General Industry Safety Orders covering noise exposure were revised in July 1970. This revision reduced the allowable noise levels about 10 decibels. It requires industries to make noise surveys and to keep exposure records as part of an effective hearing conservation program. Another adoptive action taken by the Board at the same meeting revised and updated the list of hazardous chemicals, adding 53 new chemicals to the list and giving safe levels of exposure for these materials . . . With the successful adoption by the State Industrial Safety Board of revised safety orders relating to roll-over protection, brakes, and fenders for construction vehicles, safety orders are now being developed for cranes, hoists, and derricks which will be applicable in all industries.



Choose the right audiovisual aids

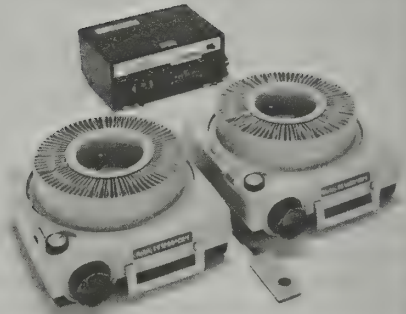
Don Adams
Motion Picture and Education Markets Division
Eastman Kodak Company

In the first article of this series, we discussed the reasons for using audiovisual aids as communications tools in safety education programs. This segment will deal with the choice of audiovisual formats.

We'll start by categorizing the audiovisual formats most commonly used in safety education:

1—Sixteen millimeter film usually is ideal when the print will be projected in a fairly large room for a sizeable audience.

2—Super 8 film provides a major qualitative improvement over the more familiar 8mm format in that it offers a picture area that is 50 percent larger. As a result, it projects a sharper, clearer image; yet, in production and use, super 8 maintains the simplicity and cost-savings associated with 8mm film. Super 8 film can be used for a



wide variety of applications, ranging from small group showings, to sophisticated programmed instruction and simple single-concept presentations.

3—Slides generally are the easiest and most economical audiovisual medium to produce, and often are the most flexible to use. Anyone owning a Kodak Ektagraphic Visualmaker (which is a kit that includes a Kodak Instamatic camera, flashbulbs and copystands) can produce professional-quality slides from all types of artwork with the simple push of a button. Furthermore, a wide choice of projection equipment and accessories allows the safety education officer to use slides in a broad variety of applications, ranging from group showings to self-instruction study carrels.

4—Multi-media and/or multi-projector presentations are becoming increasingly popular. With only a little experience, almost anyone is capable of producing eye-catching, multi-media or multi-projector shows.

But the main question is which format should you select? The answer will be determined as much by the capabilities and resources of the user, as by the requirements of the job.

The safety education director can get a headstart in the production of audiovisual training aids if he is fully aware of the resources available to him. For example, if your company is using a 16mm cameraman for other jobs, it would be worthwhile to investigate his availability for your department. Artists, persons handy with still cameras and super 8 movie cameras, and sound-recording hobbyists all can perform important collateral services by helping to produce training aids for safety engineering.

The first step in the design of an audiovisual aid is to inventory all the available ideas. You can start by getting together the people who will be involved in producing, using and filming the program. After discussions, suggest that they write their ideas on index cards—with each card containing one idea. The cards can be separated by subject and then organized into a working plan.

It certainly will be necessary to discard many, if not most, of the ideas. However, that still should leave you with the outline of a working plan. Kodak publishes a booklet, "AV Planning and Equipment," which can be invaluable to the safety engineer planning to use films and/or slides.

The working plan should be designed to achieve a specific goal of motivating an audience to do, or not to

do, something. This means that the material to be produced must be geared to a special viewer.

Once a working plan is outlined, it becomes the job of the producer-writer to create a blueprint for production. We call it a storyboard. While the storyboard should consider the narration and recorded sound, it basically is a blueprint for producing visuals.

In any audiovisual presentation, it is the job of the visuals to communicate the major share of the message. Sound provides the harmony, which can contribute to the quality of the message. However, if a narration is prepared before the visuals, the chances are that you will end up with an illustrated talk, rather than a more effective audiovisual presentation.

Only a minimum of expertise is needed to produce a workable storyboard. It is, in effect, a rough sequential layout of your audiovisual presentation.

While I have used the general term storyboard, a more accurate description would be "planning board". Each board should be used to outline and describe a pictorial sequence. The variation between one planning board and the next might be simply a change of angle or depth of field—or it could be an entirely new scene.

For convenience, either 4 x 6-inch index cards or 8 x 10-inch poster board and a felt-tipped pen can be used to create the initial planning boards. Each board should include a rough sketch of the scene and a compact description of the visuals, which will serve as a guide for the photographer. During this period, you should be considering such production variables as color, which is primarily a question of personal judgment and taste. However, if the producer has a reason for preferring that specific colors be used, it should be indicated on the planning board.

Other important considerations which should be made during this stage involve assuring the legibility of titles and other visuals, and the utilization of such basic photographic techniques as progressive disclosure.

Legibility is primarily a matter of selecting simple, readable legends for titles. Modern art supplies make it easy even for novices to achieve a professional look. Most amateur photographers are aware of the need for working close enough to the subject so that the images projected on the screen are readable. However, the producer should indicate, when making the planning board, how he wants the subject to be composed in each sequence, since he knows best how the film or slide will

be used. For example, I compose a tighter picture for a super 8 film than I do for something scheduled to be projected only in the 16mm format. Similarly, I compose tighter for a super 8 than I do for visuals which will be seen close-up in a rear-screen projector. A good general rule is that the smaller the screen and the farther the last person in the audience is going to be from it, the bigger the image should be and the closer-in the cameraman should work.

The technique of progressive disclosure can be utilized to create a feeling of movement and eliminate the possibility of boredom caused by the need to maintain legibility. For example, if you want to illustrate the dangers of a carelessly uncapped gasoline tank by showing a picture of it, this can be achieved most effectively by photographing an extreme close-up of the open tank, followed by a series of frames which reveal that it is on a fuel truck operating in a heavily populated area where children are playing. The impact and understanding builds with each scene.

A Kodak booklet, "Artwork Size Standards for Projected Visuals", provides many hints on such techniques for producers and cameramen making safety slide shows and films. The booklet explains, among other things, how progressive disclosure can be utilized by filming a colorful bar chart, one element at a time. When the slides or film are projected, the effect is to tell the entire story in an effective, eye-catching manner.

My opinion, however, is that originality is more important than expertise when it comes to making the most effective use of graphics for films and slides. Modern art materials, such as press-on letters, which come in a wide choice of styles, colors and sizes; plastic, three-dimensional lettering; and colored tapes, which can be used in various ways, including the construction of bar graphs, have made the task much simpler.

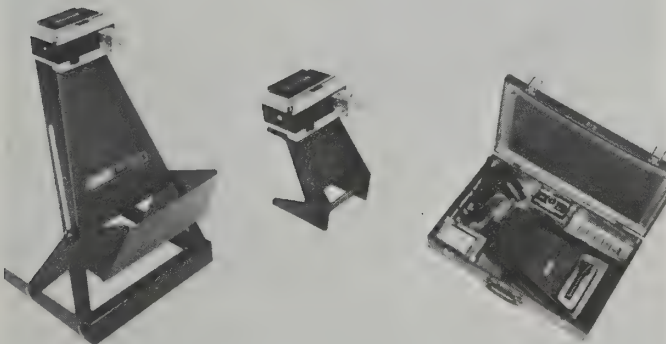
Such graphics are easy to use. Start with a 10 x 12-inch poster board as a background. A piece of tracing paper can be used as an overlay for outlining the working area. I generally use a 6 x 9-inch working area, which approximates the proportional dimensions of a slide in a mount.

A second overlay can be used to sketch the rough layout of the scene. The layout need only be rough, since it serves only as a guide. The actual artwork can go either on the poster board or on an acetate overlay. The latter permits the artist to use several colored poster boards as backgrounds for a large number of slides.

In addition to using press-on letters and symbols, colored tapes, and three-dimensional blocks, it is easy to experiment with water colors and a fine-pointed brush. Also, a scissors is probably one of the best tools available for photographic artists. Many published or printed pictures are not copyrighted and, thus, are available for you to cut out and use in your film or slide show.

A scissors also can be used to create paper masks, which can cover parts of the artwork. This is a particularly effective method for creating a progressive disclosure effect. Start out with a partially, or totally, masked picture. Then after each slide, or after every 10 to 15 film frames, stop the camera and remove part of the mask. The effect is to progressively disclose the image that you want to draw to the audience's attention.

This, however, brings us to new subjects—the actual acts of producing and using slides and film. We will deal with those in the final article in the series.





An LP-Gas fuel tank mounted on a pickup truck ruptured, destroying the tank and truck. Note how the force of the explosion bent the truck chassis downward. Part of the fuel tank (right) was found 150 yards away. (Photograph by Gordon S. Rennie.)

Caution and control make LP-Gas safe for handling, transfer

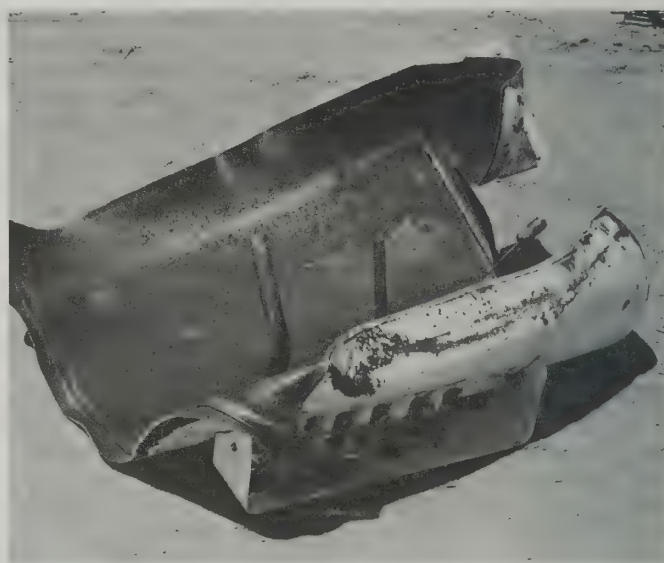
E. H. Halbrook, Pressure Vessel Safety Engineer
State Division of Industrial Safety, Bakersfield

"The tank exploded!"

That statement appears in many reports of accidents involving liquid petroleum gas (LP-Gas). But witnesses to these accidents often mean there was rapid fire with concussion. However, let me describe an accident where there was no doubt that "the tank exploded".

An LP-Gas fuel tank mounted on a pickup truck apparently was overfilled—above 86½ percent of capacity. The filling was done early in the morning, when the temperature was relatively low, and the truck was then parked for several hours. The fuel tank ruptured about noontime. The force of the explosion blew the top of the truck cab high above nearby trees and power lines, and the tank went 150 yards in another direction. There were no injuries or fire, but the truck was demolished.

Pressure in this particular vessel apparently increased as the liquid gas contents were warmed in the sunshine. Due to the thermal expansion of the product, the internal pressure had probably exceeded the theoretical bursting pressure of 1,000 pounds per square inch (psi) when the tank failed.



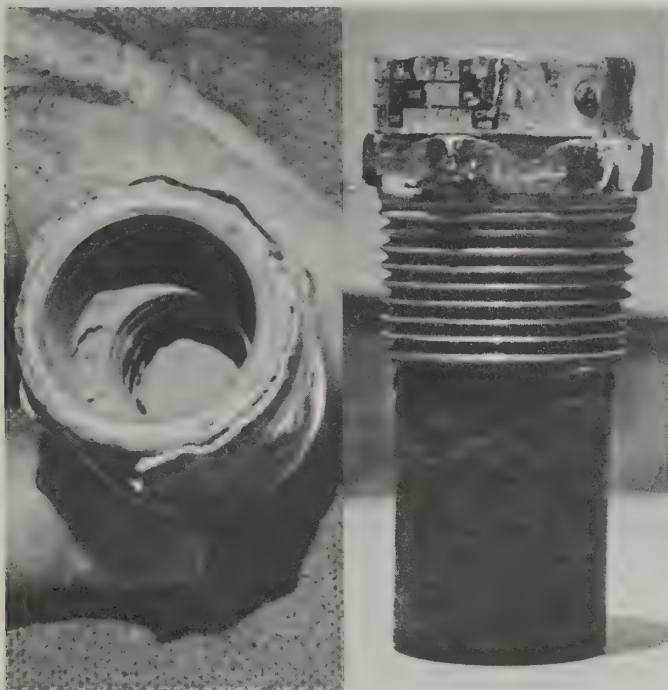
Overfilling and thermal expansion would not have caused the explosion by themselves, but there was a second factor that made the rupture certain—the tank's safety valve could not function. The spaces between the coils of the valve's spring were packed with a cement-like substance of hardened silt. After the explosion, investigators found still attached to the safety valve its raincap dust cover that is designed to fit over the valve's discharge opening. It must not have been properly installed or maintained. This accident involved a typical truck-mounted tank of average size, with about a 38-gallon capacity. Yet the tank's failure released enough force to destroy the truck.

The lessons from this type of accident are that in filling LP-Gas tanks, a vapor space must be left above the surface of the liquid contents, so that if temperatures later rise, there will be room for thermal expansion. Safety valves also must be properly maintained. A permanent outage gauge, required on all tanks of this type, should indicate when the tank is 86½ percent full. Under no circumstances should tanks be filled beyond that point.

Accidents involving LP-Gas most frequently occur during the time the product is being transferred from one vessel to another. That operation, therefore, should be performed by properly trained personnel. State Safety Orders covering Liquefied Petroleum Gas set forth the legal requirements for safe handling of these materials. The orders also serve to educate and inform. For example, the driver of an LP-Gas transport truck and trailer must be proficient in safely transporting his cargo in a variety of traffic and climatic conditions. A conscientious driver pays attention to the condition of his vehicle and will regularly test safety devices on the tanks, like excess flow valves, internal check valves, and remote control shut-off valves. He will also inspect the fusible linkage, the fire extinguisher, and all hoses used for LP-Gas transfer. Checking hoses is especially important because they get rough usage and can deteriorate from wear and weather.

The driver must shut off the engine of his vehicle, set the hand or emergency brake, and block the wheels. He must have available for the person in charge of the loading operation a valid "LP-Gas Permit to Operate" before tanks on the transports can be filled. When loading is completed and the transport is ready to leave, some companies require the driver to walk completely around the vehicle to be certain all hoses are disconnected, that wheel blocks are picked up, and all lights are functioning properly. An excellent rule to prevent pull-away accidents!

At bulk storage plants and points of delivery to customers, the driver must also observe specific safety procedures. The most basic is the following: Except during the time a request for a permit to operate remains unacted upon, no employer or employee shall use or cause to be used any pressure vessel for the storage of LP-Gas



After the blast that destroyed an LP-Gas fuel tank, hard deposits of silt remained in the tank's safety relief valve. The 3/4" pipe-size safety relief valve, taken from the ruptured tank, (right) was later pressure tested to 1000 psi but did not open. (Photographs by Gordon S. Rennie.)

without securing from the /State/Division/of Industrial Safety/ a permit to operate such vessel. (Safety Order 470 a) The product, therefore, should not be transferred into a storage facility if there is no valid "Permit to Operate" available.

Issuance of this permit means that the vessel has been inspected and certified to be in compliance with the State Safety Orders covering Liquefied Petroleum Gas, and is safe for storage of LP-Gas.

After positioning the transport for transfer, the driver should shut off his vehicle engine, set the hand or emergency brake, and block the wheels. If the truck motor is used to operate the transfer pump or compressor, the motor may be restarted after all hoses have been properly connected. During transfer, at least one attendant familiar with the operation must remain in constant attendance at the shut-off controls. This attendant may be considered familiar with the transfer operation after he has been instructed in unloading and has performed the operation under supervision, through at least three full cycles.

In addition to LP-Gas which has been successfully used for many years as a motor fuel, Natural Gas is also now being used in lieu of other fuels. Natural Gas may be stored for use in either the liquefied or gaseous phase. As a liquid, it must be refrigerated to about -260° F. As a compressed gas, pressures exceeding 2,000 psi are necessary for economic usage.

At the present time, there are no specific safety regulations available for storage and handling compressed and liquefied natural gases. The State Division of Industrial Safety is now developing such regulations, however. Public hearings on the matter are now planned for later this year.

The fuels to be covered in the proposed regulations are defined as follows:

LN-Gas—natural gas liquefied by mechanical means and consisting of about 90 percent methane and 10 percent ethane;

Natural Gas—naturally occurring mixtures of hydrocarbon gases and vapors consisting principally of methane, either in gaseous or liquid form.

For the purpose of the proposed regulations, natural gas would also contain about 10 percent ethane and traces of propane and butane. Contaminants like hydrogen sulfide and water would be minimized to prevent adverse effects on equipment for use and storage.

LP-Gas is increasingly used today as a fuel, in part because of stricter controls of air pollution. With this wider use, the legal requirements governing its safe handling and transport must be observed even more strictly. Laws, regulations, and safe practices are necessary, of course, for the protection and guidance of the general public and for the safety of employees exposed to the hazards. Safe controls, however, also require competent design, expert installation in accordance with design, and well planned and implemented operations. And finally, conscientious workers are required, those who know the safe practices and who perform their jobs accordingly.

LP-Gas, Compressed Natural Gas, and Liquefied Natural Gas are all highly flammable products and must be handled with care. While their properties are somewhat different than gasoline, with which most people are familiar, they are no more hazardous than gasoline if properly handled and used.

Fractures, dislocations, and transportation

E. F. Allen, Safety Representative, Health and Safety
Bureau of Mines, U.S. Department of the Interior, Alameda

Although fractures and dislocations and transportation are the two last fundamentals (fifth and sixth) of first-aid training, they are, nevertheless, of paramount importance.

Fractures

A broken bone is called a fracture. There are many types of fractures, but in first aid they are divided into two groups, simple and compound. In simple fractures the bone is cracked and perhaps separated but does not protrude through the skin. In compound fractures, the broken ends of the bone pass through the skin and are exposed or have passed through the skin and recessed into the tissue, causing a wound. A compound fracture will result also when an object strikes the body with sufficient force to produce an open wound and break a bone beneath. Severe bleeding may be associated with the injury or may be caused by improper handling of the victim and the fracture, even though the fracture may be of the simple type.

Broken bones, especially the long bones of the arms and legs, often have sharp, sawtooth edges. Even slight movement may cause the sharp edges to cut blood vessels, nerves, muscles, and perhaps the skin. Therefore, by careless or improper handling, a simple fracture can be converted into a compound fracture, or the injury can be made much more serious by damage to surrounding blood vessels or nerves. Such damage may greatly increase pain and shock, cause complications that will prolong the period of disability, and endanger life through hemorrhage of pierced blood vessels.

The general symptoms of fractures are pain in the region of the fracture, loss of function in the case of long bones, deformity or irregularity of the part, moderate or severe swelling, and usually shortened limbs. First-aiders should be careful when examining injured persons, particularly those apparently suffering fractures. They should not attempt to change the position of the victim until they have completed a thorough examination, nor permit the victim to sit up or stand, unless they are satisfied that doing so will not complicate the injuries.

In fractures of the extremities, first-aiders should cautiously place the limb in as nearly a natural position as possible by grasping the lower part well below the fracture but not pulling on the limb, while an assistant should support the upper part of the member on either side of the break. Appropriate padded splints should then be applied plus additional padding under all hollow spaces, such as the knee, ankle, and wrist. All fractures except those of the skull, nose, upper and lower jaw, cheekbone, shoulder blade, and ribs should be supported

until dressing has been completed. In these cases, as well as with fractures of the collarbone and upper third of the arm, the proper application of dressings is adequate to prevent movement of the injured part. This again indicates the advantages of attending a first-aid course, where participants receive instruction and practice in bandage ties that cannot be gained by only reading.

Before the limb is moved or splinted a tourniquet should be applied loosely between the break and the heart in compound fractures. The tourniquet should be tightened if arterial bleeding exists, otherwise leave the tourniquet in place, loose but ready to use if arterial bleeding occurs while the limb is being handled and the splints applied. Wounds should be dressed with sterile material; the knots, however, should not be tied over the wounds.

Shock usually follows fractures. If the patient is breathing and there is no serious bleeding, treat for shock before taking care of the patient. All fractures are major injuries, and medical care should be obtained as promptly as possible.

FRACTURE OF SKULL—A fracture of the skull is a break in its bony structure, and may occur on the top, front, sides, or back of the head. This may occur without visible wounds and is always serious because of possible injury to the brain. The victim may or may not be conscious, a mixture of blood and serum may flow from one or both ears, and bleeding may be present from the mouth and nose. If the pupils of the eyes are unequal in size, the brain has been damaged either by pressure or from internal hemorrhage. A concussion may be confused with a skull fracture, but the treatment is basically the same, and all serious injuries to the head should be considered possible skull fractures.

The victim should be kept lying down with his head raised and resting on a pad away from the suspected fractured area. Bleeding should be controlled and wounds dressed, but knots should be tied away from the wounds to prevent pressing fragments of bone into the brain. Cold applications may be applied to the head in the region of the fracture. The victim should be kept warm and treated for shock, but a stimulant should never be administered. Concussion of the brain may be confused with fracture of the skull. But, as the care of both is much the same, there is no need to distinguish between them. All serious injuries to the head should be considered possible fractures of the skull, and, if doubt exists, treated as such. Where the patient has been unconscious, even for a short time, he should not be permitted to rise until examined by a physician.

FRACTURED NECK AND BACK—Fracture of the spine or backbone may occur at any point along the spinal column between the head and pelvic basin. The spinal cord may be injured, cut, or subjected to pressure from broken or displaced vertebrae. There may be a deformity of the backbone. The back may be broken and the injury cause no damage to the spinal cord, unless the injured person is permitted to sit up or is handled improperly, in which case sections of the spinal column may be displaced and the spinal cord severely damaged. All questionable injuries to the back, even in the absence of paralysis, should be treated as a spinal fracture.

When the spinal cord is cut or subjected to pressure, paralysis of the body occurs below the fracture. First-

aiders should first determine whether the neck or back is broken. If the victim is conscious, ask him to move his legs and arms. If he cannot move his legs, and they are not fractured or dislocated, his back probably is broken. The spinal column is probably fractured in the neck region if he can move neither his arms nor legs. Paralysis may be determined in an unconscious person by pinching the feet and hands. If the victim is not paralyzed, a reflex muscular action will result. No reflex muscular action in the feet indicates a back fracture below the neck, and no reflex muscular action in the hands indicates a fractured neck.

FRACTURED PELVIS OR HIP AND LOWER EXTREMITY—Fracture of the pelvis or hip usually results from a squeeze through the hips or from a direct blow. The injury is frequently accompanied by rupture of the bladder, which should be corrected within the first hour or two for any hope of success. The symptoms of this fracture are not easily detected. Therefore, when an injured person complains of severe pain through the pelvic region, he should be kept lying on his back and the pelvic area should be supported.

Fracture of the thigh, knee, leg, or ankle usually can be recognized by the pain in the area, swelling, deformity, and inability to use the part below the fracture.

Shock, which usually follows fractures, should be treated, and medical care should be obtained as promptly as possible.

Dislocations

Where two or more bones come together without a bony union between them, they form a joint. Bones at a joint are held in place by bands of strong, fibrous tissue known as ligaments. Immovable, limited motion, and freely movable are the three varieties of joints. First-aiders are concerned primarily with the principal freely movable joints, namely, the lower jaw, shoulder, elbows, wrists, fingers, hips, knees, ankles, and toes. Dislocations result from force applied at or near the joints caused by sudden muscular contractions, twisting strains, or falls where the force of landing is transferred to the joint. The dislocated joint is rigid and cannot be moved by the victim. Swelling usually is present, pain is severe, and a deformity exists when compared with the normal joint on the opposite side of the body.

No attempt should be made by first-aiders to reduce dislocations, except those of the lower jaw, fingers, and toes. Where medical aid is readily available, first-aiders should not attempt reductions of even these. First aid for dislocations consists essentially of immobilizing the joint in the line of the deformity and treating for shock, which is frequently present.

The Editor of the California Safety News, the U.S. Bureau of Mines, and the author of these articles strongly suggest that people in industry attend a formal first aid training program at the first opportunity. Everyone should make a determined effort to work, drive, and above all, live safely. But since it would be wishful thinking to believe that another accident and another injury would never occur, as many people as possible should gain the knowledge necessary to render assistance and perhaps prolong life. If this occurs but once, the time and effort spent by everyone concerned are fully justified.

SPLINTS—Splints are used to support and protect fractures and dislocations, and where these are suspected. They may be made from any stiff material, but preferably from something that is sufficiently long to prevent movement at adjacent joints and as wide as the limb to be supported. Wood, metal, cardboard, magazines, newspapers, or similar material will suffice. Splints should be padded with soft material on the inside and on ends that contact the body, and additional padding should be applied to support natural arches. Splints for fractures of the neck and back should be constructed of two boards, each 7 feet long, 6 inches wide, and 1 inch thick, and three boards, each 22 inches long, 4 inches wide, and 1½ inches thick. The short boards should be nailed, screwed, bolted, or securely tied to the long boards at areas corresponding to the victim's shoulders, hips, and heels. The long boards should be separated about 2 inches, and they should extend 15 inches beyond the shoulder crosspiece and 3 inches beyond the heel crosspiece to support the victim's head and feet. Each long board should be padded separately with blankets, canvas, clothing, or similar material. A folded single blanket tied on each long board of the splint provides the most effective padding. Splints should be tested for strength in all cases just prior to being used to support the weight of the victim.

A splint for the lower two-thirds of the arm, the elbow, the forearm, or the wrist preferably is made of two pieces of board ¼ inch thick and 4 inches wide. One piece should extend from 1 inch below the armpit to the point of the elbow, and the other from the point of the elbow to 1 inch beyond the middle finger. The boards should be fastened securely in the form of an "L", and ample padding applied. Where the bones of a fracture are so located that they will contact the splint, the padding should be arranged to form an arch of sufficient height to prevent pressure on the bone ends. Padding should be also arranged to prevent pressure on the tourniquet if one has been applied.

The victim should be placed face down on the splint with a fractured back, but face up for other fractures. If the victim is found lying in such a position that he must be turned to be placed on the splint properly, extreme care must be taken to prevent undue movement of the injured part. Do not turn the head in fractured neck injuries or twist the back in fractured back injuries. First-aiders should not attempt to pull the bones into position in compound fractures, and they should always support a fractured pelvis before placing the victim on the splint.

Splints should be tied firmly in place, but not so tightly they restrict circulation. Bandages, belts, handkerchiefs, strips of clothing or blankets, and similar material may be used as ties. To facilitate placing of bandaging material, a thin stick can be used to slip the material under the body or limbs through clearance afforded by natural arches. After the bandages have been passed under, they can be moved gently one way or the other to the position where they are to be tied. Knots should be tied near the splint or in an area that will not cause the victim discomfort.

Fifteen bandages are required for a fractured neck, 13 for a fractured back, and four for a fractured arm, and they should be tied above and below the fracture or above and below the dislocated joint.

REDUCTION OF DISLOCATIONS—Although it is far better to leave reduction of dislocations to a physician, in instances when it may require several hours to obtain this service, an effort may be made to reduce dislocations of the jaw, fingers, and toes. A dislocated jaw is painful, the mouth is open, the jaw is rigid, and there is difficulty in speaking. To reduce this dislocation, first wrap both thumbs in several layers of cloth and place the thumbs in the victim's mouth, resting them on his lower teeth well back on each side, with the fingers under the jaw on the outside. Press first downward, then backward, and as the jaw slips into place, move the thumbs from the teeth to the inside of the cheek to prevent pinching between the teeth when the jaw springs into its natural position. Dressings should be applied to support the member until medical aid can be obtained.

To treat a dislocated finger or toe, grasp just above and below the dislocated joint, and pull straight away from the hand or foot. The bone usually will slip into place. If difficulty is experienced in reducing a dislocation, do not make repeated attempts, but have the patient consult a physician as quickly as possible. Do not attempt to reduce a dislocated finger if a wound exists near the joint, because the joint may be damaged and the injury could be compounded. Other dislocations should be immobilized in the line of deformity by first-aiders and reduced by a physician.

Handling and Transportation

After receiving first aid care, a seriously injured person often requires transportation to a hospital, a physician's office, or home. It is the responsibility of the person administering first aid to see that the victim is transported so as to prevent further injury and to see that the victim is not subjected to unnecessary pain or discomfort. Even though professional first aid care may be administered, improper handling or careless transportation of an injured person often adds to the severity of the original injury, increases shock, and frequently endangers life.

A victim should not be moved until a thorough examination has been made and all injuries are protected by proper dressing. Seriously injured persons should be moved in only a lying position. If facilities for proper transportation are not readily available, continued care should be administered to conserve the victim's strength until proper transportation can be procured. Various carries can be used in emergencies, but a stretcher is preferred. Other methods should only be used when the injury will not be compounded by such methods.

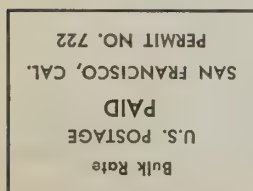
THREE-MAN LIFT AND CARRY—This carry may be used when a stretcher is not available, when only a

short distance is to be traveled, or when transporting through a narrow passageway. The lift is also used when an injured person is placed on or removed from a stretcher. Three persons are required for the lift, and a fourth is desirable. Each first-aiders kneels on one knee and all of them on the same knee on the least injured side of the victim adjacent to his shoulders, hips, and knees. The bearer at the feet places his hands under the patient's knees and ankles, the center bearer places his hands under the patient's thighs and small of the back, and the bearer at the head places his hands under the neck and shoulders. Someone (usually the person who has assumed responsibility for treating the patients) should supervise the activity. He should give the command, "Lift Patient," at which time all first-aiders should lift simultaneously and support the victim by resting their forearms on their knees. At the command, "Prepare to Rise," the bearers should slowly turn the patient on his side so that he rests in the bend of their elbows, face in and held closely to their chests. With the patient held in this position, the bearers can move safely forward, backward, or to the side in short steps taken slowly. To lower the victim, the steps outlined should be reversed.

STRETCHERS—The Stokes Navy and the Army-type stretchers are most commonly used. The Army type consists of two long poles with a canvas bed and with cross-pieces to keep the poles separated and the canvas tight. Canvas has a tendency to deteriorate after continued storage and nonuse, so this type stretcher as well as other types should be tested by lifting it when a person at least as heavy as the victim is on it. The Stokes Navy stretcher is a woven-wire basket made to conform to the human body. When a victim is strapped securely to this stretcher, he may be placed in a vertical position and raised or lowered from a confined area.

A satisfactory stretcher may be improvised with a blanket, canvas, coats, a sleeping bag, or other similar material, and two stout poles or pieces of pipe. The short side of the blanket or canvas is folded over one pole toward the opposite side. The second pole is placed on both thicknesses of the material about 2 feet from the parallel to the first pole. The remaining side of the material is folded over the second pole and toward the first pole to complete the stretcher. When the injured person is placed on the unit, the weight of his body secures the folds. Bags and sacks may be used for stretcher beds by passing poles through them. Jackets serve nicely when they are turned inside out, buttoned or zipped closed, and poles passed through their sleeves. A wide board or a door can also be used to transport an injured person.

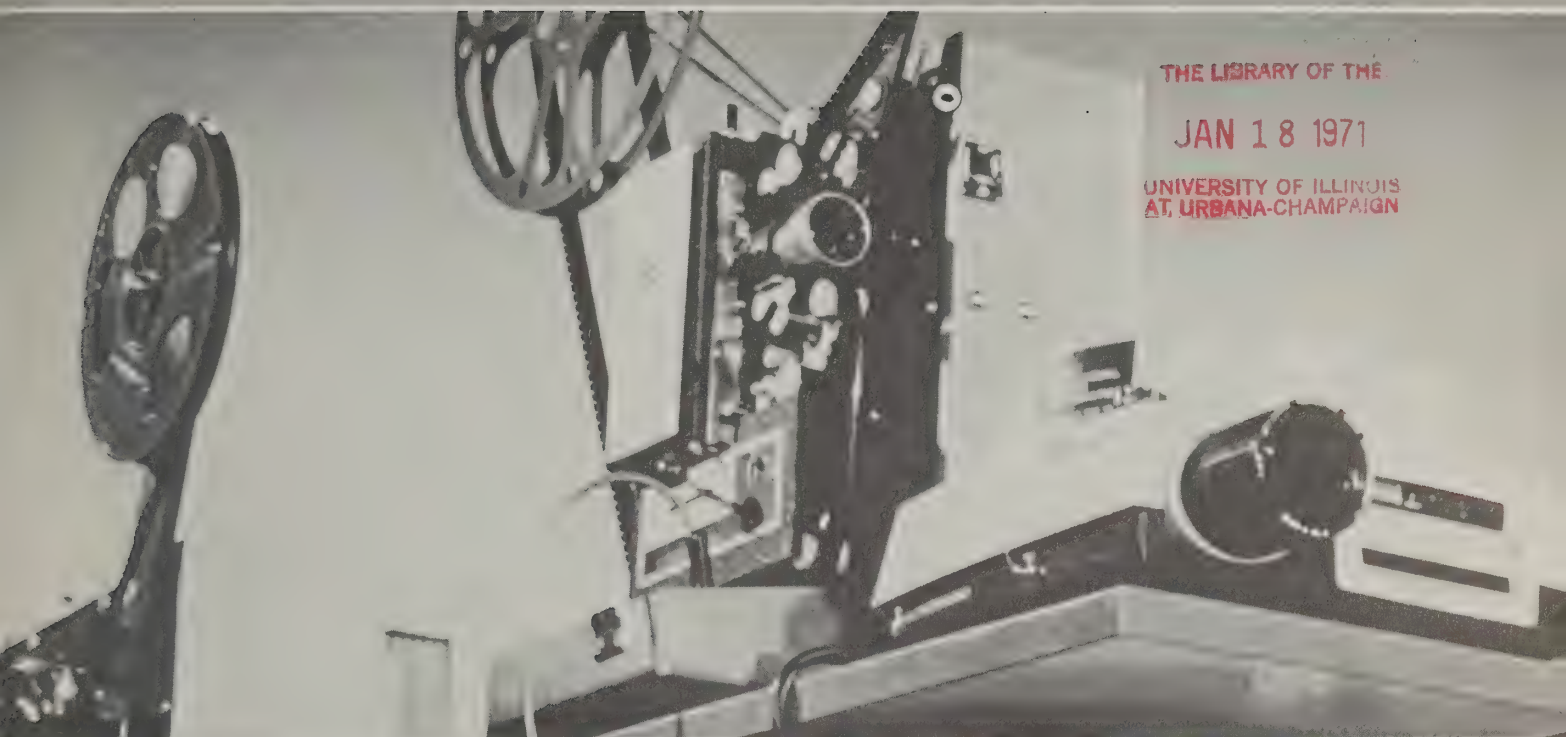
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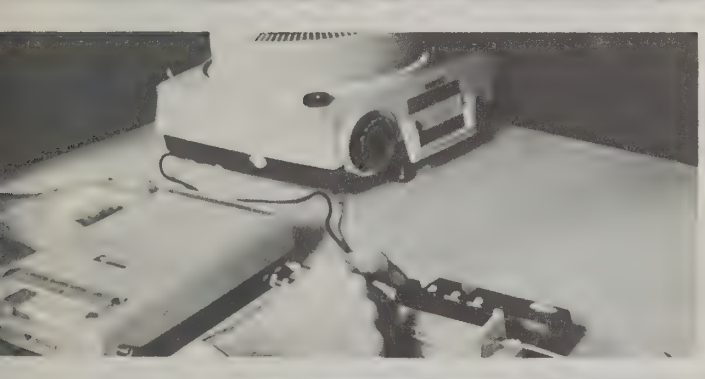
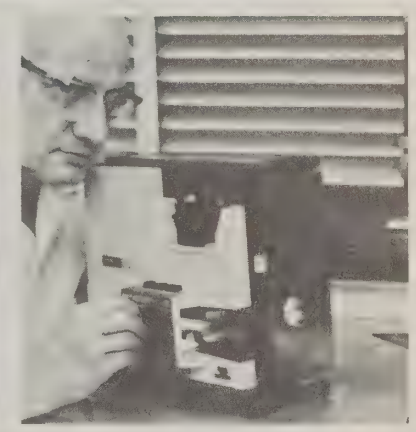
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CALIFORNIA

**SAFETY
NEWS**

SEPTEMBER, 1970



Chiefly speaking

Sometime ago the radio on my car went dead. Having a little spare time at home over the weekend, I decided to remove it from underneath the dashboard. I was lying flat on my back on the floorboards and was attempting to remove the two hook-shaped bolts about $\frac{1}{4}$ " diameter and 6" long which held the radio in position. All of a sudden one of the hook bolts fell. I didn't have time to see it coming, and it hit the center of one of the strong lenses of the safety glasses I was wearing. The lens was marked a little bit—but no injury to my eye. And for that I was thankful. Several times since this incident I've speculated what would have happened to my eye had I not had those prescription safety glasses on. Probably the end of that fairly large bolt would have hit my open eye after a free fall of about 20 inches.

Those safety glasses likely prevented a tragedy. They were the same kind of glasses that thousands of California workmen wear every day.

Most employees understand the benefits of "dressing safely" for work to protect themselves from hazards—but some do not.

Some men have accidents because they have a "spirit of fatalism." Maybe you have heard them express it this way: "Why try to avoid accidents? If you're going to get hurt, you're going to get hurt. Accidents are bound to happen, and nothing you can do can prevent it." These people are dangerous—to themselves and to those who work with them.

I would not want to ride on a plane whose pilot believed that precautions were not helpful to safety. I would not want to ride in a train whose locomotive engineer didn't believe in safety signals and equipment.

And I sincerely hope that the druggist who makes the drugs and fills the prescriptions for my grandsons when they are sick, doesn't shrug his shoulders and say: "Accidents will happen."

Life would, indeed, be hazardous if no one believed that accidents could be prevented.

Jack F. Hatton

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RESEARCH AND EDUCATION

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Don Adams
Motion Picture and Education Markets Division
Eastman Kodak Company

Slides and films can 'turn them on' for a safety message

My position as a motion picture and education markets representative with the Eastman Kodak Company brings me into daily contact with a great variety of people. I have, for example, been called into a major Hollywood studio to help solve a technical problem that was holding up a multimillion-dollar production. I have also been at many television stations where solutions to crises had to be found quickly to get the news on the air on time.

My most unusual experience, however, occurred when I was asked by my 10-year-old son to assist him in producing an audiovisual report on tropical fish for his science class. We utilized a Kodak Visualmaker which enabled him to copy illustrations and make close-up slides of his own tropical fish. His completed presentation consisted of 30 slides and an accompanying script. Needless to say, he got a high grade on the assignment.

There is a lesson to be learned from that incident. That is, since the days when we went to school, entire generations of students have become audiovisually ori-

ented. They grew up seeing and hearing thousands of hours of television and theatrical films. They often learned how to use cameras and projectors at very early ages. And their schools made broad use of audiovisual communications as teaching tools.

As a result, they "turned on" to slides and films. For them, these media have become extensions of talking and writing, and very effective extensions at that.

Nowhere should this message ring louder or clearer than for people in the profession of safety engineering. While there are many facets of your job, most of them add up to one criterion: safeguarding the lives and health of your company's employees. Attempting to achieve this goal without a thorough awareness of the potential of audiovisual media can minimize the effective retention of the information offered.

That's because through the proper use of audiovisual aids, it is often possible to communicate more effectively than in any other manner. You can generally hold the attention of an audiovisual oriented audience (whether it is made up of one person or a thousand) more effectively with a film than by talking to them or giving them something to read.



Animated slides attract audience attention to an important point and make the point easy to remember.

Also, it has been proved time and again that it is easier to explain concepts and to clarify points with pictures than with words. It's the difference between telling someone how they could lose a hand if they operate a certain machine carelessly and showing them a filmed simulation of such an accident.

Test after test has proved that the visual impact of seeing the latter helps the subject to retain information more fully and longer. These, of course, are not the only advantages of audiovisual communications.

Another important consideration is that it allows a speaker and an audience to share an experience, which they can later discuss. By participating in watching a presentation, the safety director sets himself up in a much stronger position for becoming involved in discussing the problem.

Finally, the utilization of audiovisual aids allows the safety education director to distort time and space. By that I mean that the audience can visually be transported anywhere, see anything, and at any speed.



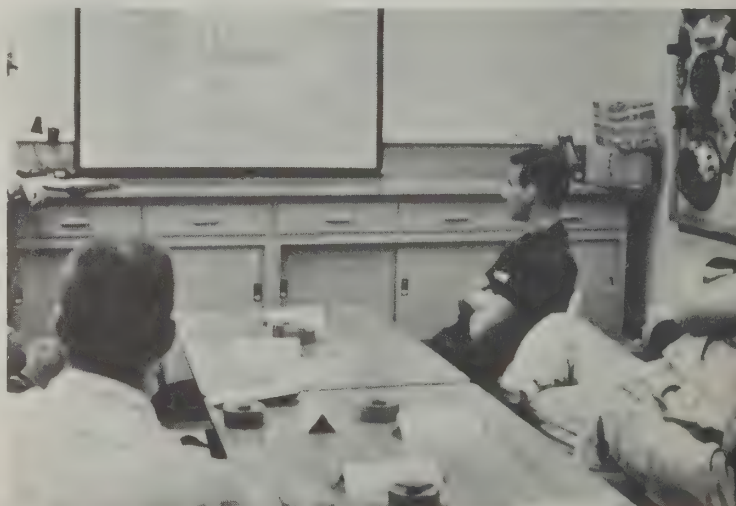
This scene for a safety film will show as well as tell the importance of protective clothing.

In fact, to echo Marshall McLuhan, the media does become the message, meaning the safety director can utilize audiovisual communications to preserve the quality of his original message and yet not have to be there every time it is given.

This capability of audiovisual communications in fact multiplies the capacity of the safety education director to reach more people more often.

All of these considerations require the safety education director to have a basic knowledge of the various choices available in audiovisual communications, so he can select the proper methods for solving individual problems in the most efficient manner. There has been a revolution in both the way audiovisuals are produced and in the manner in which they are used. The most important implication of this revolution for the safety education director is that he can now produce more of his own materials more economically and present them more effectively than ever before.

The Kodak Ektalite screen in use here allows clear viewing in normal room lighting.



Many considerations enter into the selection of media. Most important, of course, is having a clear understanding of what you want to achieve and how much you are willing to spend to do so. After you have isolated these facts, then you must determine who your audience is and what motivates them.

Clearly, if your audience is a small group of supervisors who will meet in a central conference room for a one-time presentation, you are dealing with people who can probably be motivated by appealing to their pride, responsibility and loyalty.

On the other hand, if your audience is made up of part-time summer replacements, who will be educated as and where they are hired, the message and, therefore, the media can be completely different.

There are other key questions to ask when identifying an audience. One such question deals with the members' level of education, both scholastically and within the company. What terminology will they understand and what must be simplified? Only after you have answered all such questions can the proper media be chosen.

The latter also requires that you have more than a rudimentary knowledge of the state of the audiovisual art. What do you produce in color and what in black and white? How about sound? When do you choose 16 mm and when super 8 film? When slides? And, for that matter, what can you produce internally and what comes from a library or requires the services of an outside producer?

The answer to many of these questions is that you may be able to produce more audiovisual aids than you suspect by yourself—and on a small budget.

Our Ektagraphic Visualmaker, for example, allows almost anyone to produce professional quality slides from artwork. Even a novice can put the slides together into a format which tells a story. The story can be tape recorded and supported by music. The latter is easily synchronized, so the sound not only supports the illustration but also controls the projector.

And that's just one of the choices available. Subsequent articles in this series will discuss the selection of audiovisual media, planning and production, and the use of safety education materials.

Slide message about traffic deaths helps audience see and remember figures that would be difficult to retain if only read.



Merced mosquito 'killers' stress worker safety

John W. Myers, Safety Engineer
Industrial Section, State Division of Industrial Safety
and
Douglas White, Manager Entomologist
Merced County Mosquito Abatement District

Before construction of the present system of dams on the San Joaquin and Merced Rivers, as well as on several smaller streams, the extensive flatlands were subject to frequent inundations, according to Merced County historical files. The flooding produced large numbers of mosquitoes, and malaria was then fairly common. The hordes of floodwater-type mosquitoes also created an extreme nuisance. For relief, residents burned smudge fires made of leaves and other vegetable matter; later they screened buildings.

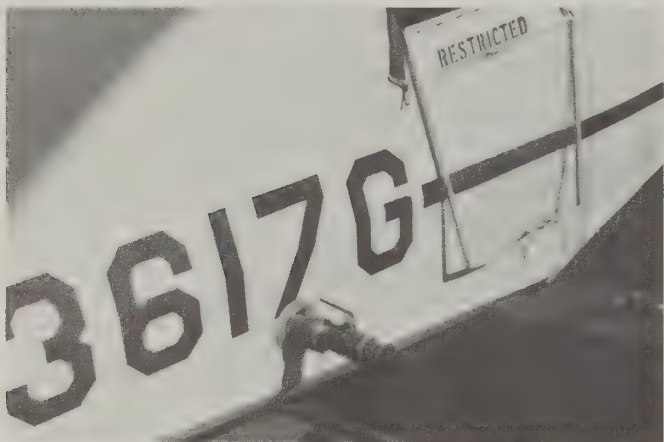
Despite increased irrigation near Merced and arrival of new residents, not until 1923 was there any community-wide mosquito control. Several leading citizens supported by residents sponsored a one-man control operation using diesel oil as the killing agent on an area of 17 square miles. In 1941 the Merced Mosquito Abatement District was expanded to 90 square miles around the city of Merced and additional help was employed. Then in 1945 when the public had awakened to the need for more extensive mosquito controls, the Merced County Mosquito Abatement District was formed. It comprised the entire county of 1,995 square miles, and its facilities now include the main depot at Merced, and sub-depots at Dos Palos, Los Banos, Gustine, Stevinson, and Livingston. Control operations utilize three aircraft, one helicopter, a helicopter nurse rig, seventeen ground rigs, and eight support vehicles.

Ground Spray Operations

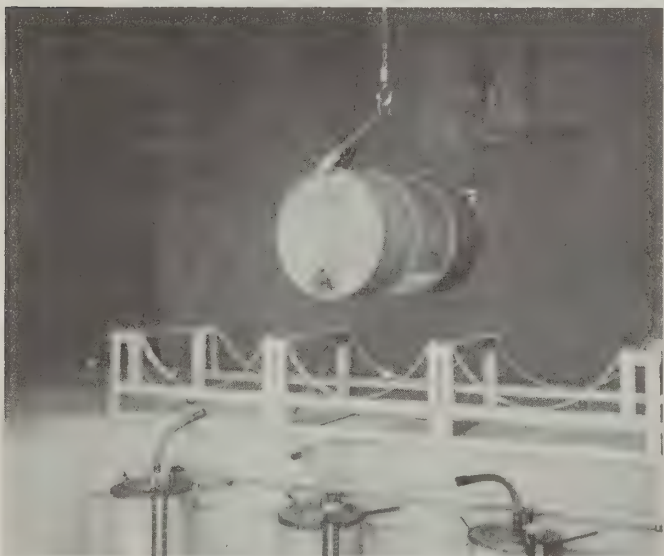
Ground spraying uses mobile hand-spray rigs and mobile mist-blower rigs. The hand-spray rig is a conventional pickup truck equipped with a pressurized-chemical mixture tank. Air pressure for the tank is supplied from a compressor driven by the truck's engine, and the chemical mixture is sprayed from a hand-controlled nozzle. The hand-spray rigs are used for spot treatment and spraying in confined areas. The District has three mist-blower rigs, two with a pressurized tank feed and the other a direct pump feed, each mounted in a conventional pickup truck. These units were developed to remove the operator from possible contact with the spray material. Controls in each type of rig are mounted in the truck cab where the entire operation of the spraying unit is controlled. Power for the pressurized tank unit is supplied from a small 4-cylinder gasoline engine (Crosby) which drives the mist-blower and air compres-



Insecticide tank fitted on the helicopter is filled through bottom loading connection from a tank truck used as "nurse rig".



Bottom loading of aircraft is through this special closed coupling valve on the airframe. The valve holds down fumes and prevents contact with material being loaded.



A closed system for handling spray materials removes them from possible contact with personnel. This hoist is used to lift pesticide barrels into saddles where barrels are then connected to measuring containers.



This "nurse rig", used to fill a helicopter spray tank, features a closed transfer system.

sor to pressurize the tank. The blower for the newest mist rig is powered by a small, one-cylinder gasoline engine. Spray mixture is drawn from a 30-gallon drum by a small, electric-powered hydraulic pump and injected into the discharge air stream from the blower. The trajectory of the spray from each unit is controlled by rotating the blower housing through a chain and sprocket driven by an electric motor.

Aerial Spray Operation

Following the organization of the county-wide district in 1945, it became evident that effective coverage of the large area would require airplanes to supplement the ground rigs. The first aerial spraying, under contract with a local aerial spray applicator, used DDT and Xylene, which the District mixed at the headquarters and transported to the air strips where it was diluted with diesel oil and pumped into the plane. In 1947 the District purchased a small Aeronca airplane and equipped it with suitable spray devices. The plane was used seven days a week on morning and evening flights, and the District found it necessary to hire a second pilot. The aerial fleet continued to grow until it now numbers three Call-Air A-9 airplanes and a Bell helicopter. The three pilots each hold FAA certificates for fixed wing and rotor craft.

In 1954 the District again started the season using the DDT-toxaphene formula as in the past years. However, because of the mosquitoes' resistance to the hydrocarbons, the District switched to the organic phosphates Parathion and Malathion. These concentrated organic phosphates were purchased in 55-gallon drums, drawn off into gallon buckets, and dumped into the airplane spray tank to which water was added from a tank truck. This procedure was time-consuming and exposed the personnel to extremely hazardous chemicals. In 1955 District personnel built a siphon-type mixing system, so that the insecticide could be introduced into the airplane spray tank in the water and eliminate human handling. This device was improved in 1965 by replacing the open-funnel measuring container with the closed type.

The system is operated on a siphon principle, utilizing water pressure from an electric-driven centrifugal pump. The insecticide concentrate is drained from the drum and measured into a graduated, closed container which is permanently connected by a metal pipe into the system.

The graduated container is vented to a safe location above the roof of the facility through a separate line. Water is supplied to the pump from a nearby storage tank fed from the domestic water supply. The storage tank is equipped with an air-gap safety device to prevent contamination of the domestic water supply, and the water level in the tank is regulated by a float-control valve. Water is gravity fed from the storage tank into the pump which delivers the water into the line leading to the airplane. A large dial meter in the line registers individual loads, as well as totals, and facilitates accurate formulation of the field strength spray. The delivery line from the installation to the airplane passes underground for 20 feet to a junction box where it connects to a flexible hose; on the end of the hose a special, manually-operated, shut-off valve is attached. This special shut-off valve is a safety device and connects to its mating part which is attached to the bottom loading line from the airplane's spray tank. The transfer of water from the storage tank, and of the insecticide from the drums to the airplane spray tank, is maintained in a completely enclosed system. The flow of the spray emulsion is regulated at a control point adjacent to the meter, and the control valve at the end of the hose is a safety device to prevent leakage after withdrawal from the spray tank. When not in use, the delivery hose is stored in the underground junction box which is covered by a hinged metal cover provided with a lock. Each of the five depots operated by the District has the siphon-type insecticide mixing and loading system.

The District continually works to improve safety and efficiency in aerial spray operations, and in 1968 it developed and installed equipment in one plane for ultra-low volume spraying. Low-volume spraying uses the chemical in a concentrated form and allows safer and more efficient aircraft operations by reducing the aircraft load from 800 pounds to 160 pounds. This lighter load is a major factor in aircraft operations in the San Joaquin Valley during summer when high temperatures create an equivalent altitude of about 3000 feet with an associated loss of about 10 to 15 horsepower in an aircraft's engine. To continue operations during the hot days, either loads must be reduced or larger and remote air strips used.

As the cities expanded and housing projects impinged on the surrounding fields, demand for spraying also grew. But flying over and around these populated areas caused much anxiety for the residents and grave concern to

pilots. To reduce any possible danger, in 1966 the District purchased a helicopter for spraying in and around the populated areas. To maintain safety for the loaders, a tank truck was equipped with a system similar to the fixed insecticide mixing installation at the depots. As the nurse rig for the helicopter, the truck carries 750 gallons of water in three tanks and 155 gallons of aircraft fuel in another tank. Racks installed at the rear of the main tanks hold two 30-gallon drums and two 55-gallon drums of chemical concentrate. Below the lower tier of drums are two graduated measuring containers directly connected to the lower drum and in turn directly connected by a drain line to the mixing tank. The mixing tank, located under the truck bed directly behind the rear wheels, has a capacity of 140 gallons of emulsion. Fuel tank, pump, strainer, and hose are separated from the water supply tank and system to prevent contamination. A special non-return flow valve is installed in the piping between the main tanks and the mixing tank to prevent contamination of the main water supply. During the early joint operation of the rig, it was discovered that a high potential of static electricity often built up and remained in the helicopter even when it was on the ground. A grounding conductor recommended by the helicopter manufacturer was installed, with one end securely attached to the truck, and the other end equipped with a special connector to mate with the one installed on the helicopter. No further static electricity has been detected when replenishing the helicopter.

The District stresses safety in all phases of its aerial and ground operations. In the insecticide mixing and loading facility previously described, the concentrate flows from the insecticide drum into the closed, siphon-measuring container, then into the aircraft or ground rig. No handlers come directly in contact with the concentrate. As an added precaution, rubber gloves, goggles, and approved respirators are available. There is a shower at all mixing and loading installations as well as hand-washing facilities, soap, and disposable towels. Work uniforms, on a rental basis, are provided by the District to permit daily changes, or at more frequent intervals, if necessary. All personnel have cholinesterase blood tests before spray season begins, and at regular intervals thereafter. Pilots have additional blood tests at intervals established by the medical supervisor. Frequent "tailgate" safety meetings are held to discuss hazardous material handling and other safety subjects. It is mandatory that all pilots, when flying, wear a crash helmet and a shoulder harness. To maintain efficiency and safety, pilots are limited to 6 hours flying time in one day; 25 hours in one week; and not more than 6 consecutive days.

Cleanliness of planes and ground rigs is constantly maintained. A concrete wash basin at the headquarters facility is equipped with a separate drain sump to catch the contaminated washings from the vehicles and prevent contaminating the surrounding area.

Strict control of empty chemical containers is maintained. When emptied, the caps are securely replaced and returned to the manufacturer.

This intense interest in, and practice of, safe working habits in a very hazardous operation has resulted in an enviable safety record. In its many years of operation the District has never had an employee seriously ill or injured while on the job.

With this large mist-blower, all spraying is controlled from the truck cab to remove operator from contact with spray material.





First Line Supervision

The right place to prevent worker injuries

The punch press at a large manufacturing plant seemed to work all right, at least for the first few minutes at the start of a recent morning shift. But after about ten cycles, the press double-tripped, catching one of the operator's fingers and severely crushing it.

A safety engineer with the State Division of Industrial Safety reported that the failure was probably caused by a blocked exhaust line on the air cylinder controlling the trip mechanism. Company investigators had found a one-quarter inch pipe plug in the exhaust line that apparently caused the air cylinder to become progressively sluggish in returning to its normal position as the press ram descended. By the time the operator hand-fed about ten parts, the single-trip device failed, and the ram double tripped. (See photo above.)

To eliminate accidental or intentional blockage of the air flow in the future, a heavy bronze screen was brazed over the exhaust port. In addition, manufacturers of the control equipment and of the solenoid-operated exhaust valve were given details of the accident, along with the recommendation that the exhaust port be modified to prevent accidental or intentional blockage. (See photo below.)



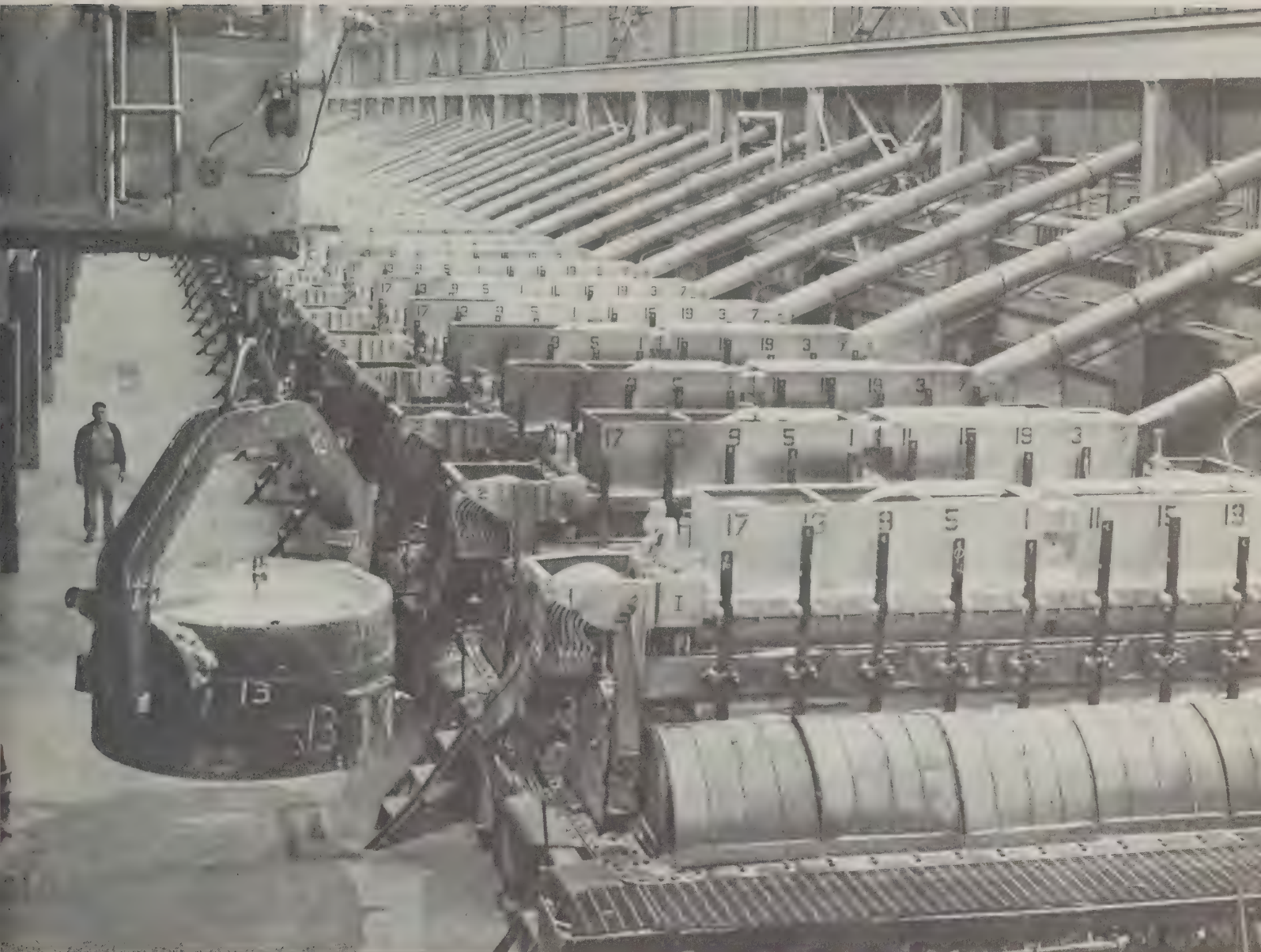
**H. K. Lambie, Director of Safety and Protection Services
Kaiser Aluminum and Chemical Corporation**

How can safety professionals improve accident prevention skills? What should we be doing differently in 1970? What problems must we solve to reduce the accident problem?

Let me share with you my thoughts and answers to these questions.

First, consider these brief reviews of two serious accidents. A boom crane collapsed because an employee did not follow standard written procedures in tightening the clamps of one guy cable. This accident caused the death of eleven men.

A young mechanic was climbing a ladder with a hand full of tools. He fell less than ten feet to the ground. The



Increasingly typical of the modern workplace in the U.S. is this aluminum reduction plant of Kaiser Aluminum and Chemical Corp. at Ravenswood, West Virginia.

prognosis is that he will never be able to walk again. The cost? It's estimated at over \$100,000. The suffering? It's probably incalculable.

Accidents like these occur by the thousands. So why do people take chances, risk their lives and the lives of others, and risk millions in losses?

What can we do to stop them for their sake and ours?

We all know the problem of accidents, and all agree something must be done to reduce this problem. But the question is, "WHO" is going to do it and "HOW?"

FIRST, consider WHO is directly and indirectly involved in reducing job accidents and what are their functions and job responsibilities?

SECONDLY, what should they do differently to increase the effectiveness of accident prevention?

Who Is Involved With the Accident Problem?

The individuals and groups directly and indirectly involved with the accident problem and who can best take control action are:

- governmental agencies;
- company management and their safety experts (if they have one);
- workers and their unions (if they belong to one).

However, it is not clear which of the three groups has the responsibility, the authority, the knowledge, and the skill to make accident prevention work.

Let me illustrate the basic problem with a few examples.

A forklift driver got off his vehicle in order to open the warehouse door which was in front of him. The

forks were left at a height of four feet, and the hand brake was not set. You can readily visualize what happened next—the vehicle drifted ahead, pinned the driver against the door, and killed him. Of course, the rules require that forks be lowered to nearly ground level, and that the hand brake always be set before leaving the vehicle. But the driver did not comply with either rule.

A welder was performing an underground acetylene welding job in an area which contained piped flammables. He took all the required precautions except one—he pointed his torch behind him without looking and burned through a copper line which contained flammable liquids. His unsafe act resulted in 74 deaths and over \$70 million worth of losses.

The unsafe act of constructing a scaffold with a defective board caused the death of seven men who fell 70 feet when the board failed.

WHO could have prevented these accidents? The state inspector? The worker? The supervisor?

WHO should coordinate their efforts since all three groups in most cases are involved directly or indirectly?

There is no doubt that all of these individuals are sincerely interested in preventing accidents. These accidents and many like them reflect failures to control the problems. This problem is reflected also in national statistics which show we have made very little progress in reducing the frequency of accidents in the last ten years.

The question is **WHY?** What are we doing wrong? Why are we not more effective? What must we do differently in order to progress?

Let's start by considering individual responsibilities.

What Are Individual Responsibilities?

An analysis of accidents in industry indicates that 95 percent of them occur to workers at the job site as a result of unsafe acts and unsafe conditions. Whose responsibility is it to control these unsafe acts and unsafe conditions?

Government? Management? Labor (the worker and his union)?

Before we review what their responsibilities are, let us clarify **who** they are, **how** they function, and what means they have for solving the accident problem.

Who Is Government and What Is Their Function?

When we refer to government, we can consider primarily the personnel of the Department of Industrial Relations, Division of Industrial Safety, and other state and federal agencies which enforce safety codes.

These officials usually have the legal authority to demand compliance with established safety codes when management for some reason fails in their responsibility to comply with regulations voluntarily.

Most governmental staffs are well qualified, and the codes they enforce are sound, based on experience, and, when complied with, reduce accidents.

Who Is Management and What Is Their Function?

Management personnel are identified by many titles, such as directors, presidents, vice presidents, managers, staff engineers, industrial relations staff personnel, superintendents, supervisors, foremen, etc. These titles denote a level of responsibility in guiding subordinates.

Surveys indicate that safety responsibilities are poorly defined or little understood at all management levels;

therefore, let me propose, for the purpose of solving our safety problems, that management in industry be considered as a two-level group only:

- 1) **First Line Supervision**—that is, the level of management which directs and controls the job activities of the worker;
- 2) **Back-up Management Line**—that is, all levels of management above the first line supervision who assist the first line foreman to solve all his production problems including control of hazards through
 - engineering
 - training
 - motivation
 - management controls and similar means.

In short, the first line foreman has direct responsibility over the area wherein 95 percent of our industrial accident problems are created and wherein they can and should be controlled. He must see that employees under his supervision wear safety glasses to save their eyes, use lock-out procedures to save their lives, have a fire extinguisher ready to prevent a million dollar fire, or do whatever must be done to minimize the possibility of accidents.

The idea of considering management as a two-level function may profitably apply to solving other industrial production problems as well.

Who Is Labor and What Is Their Function?

They are the labor organization personnel. Their duties are identified by almost as many titles as the management group: International president, vice president, staff, directors, district directors, local presidents, stewards, committeemen, and the worker.

In solving accident problems, consider these two important issues:

- 1) The worker is involved in over 95 percent of the accident problems—he needs guidance and control to avoid unsafe acts and conditions which could result in accidents;
- 2) The worker may seek safety assistance from his immediate supervisor (the first line management) or he may look to governmental agencies, or the officers of his union, or he may call on all of them.

If everybody gets in the act, the problem becomes complicated; and a shared responsibility is essentially **NOBODY'S RESPONSIBILITY**.

Please do not misunderstand. I am not suggesting that they should not all be involved. I am only suggesting **HOW** they should become involved.

Suppose that the worker looks only to his supervisor for guidance and control in solving safety problems and preventing accidents. His supervisor, therefore, must have the sole responsibility for controlling and correcting unsafe acts and unsafe conditions in his assigned area.

When this system fails, for any reason, I should then like to propose to the union organization that it consider itself a two-level organization in dealing with safety problems; that the safety committeeman be regarded as the first line and all others above him in the union organiza-



A worker at the Chalmette, Louisiana plant of Kaiser Aluminum and Chemical Corp. skims freshly poured primary aluminum ingot.

tion as the back-up line. The union safety committee's responsibility should be to assist the first line foreman in directing employees under his supervision to do a better job of recognizing, understanding, and controlling the hazards of their work.

When the union safety committeeman fails to do his job, the union back-up organization should assist him. This approach is the same as that proposed for management. When the first line supervisor fails, management does not take over his job; they help him get it done.

What Are We to Do Differently to Reduce Accident Problems?

The fact remains that over 95 percent of all accidents occur while the worker is doing his job under the direction of the first line supervisor. We can conclude that either or both made an error. Otherwise accidents would not continue to occur at such a high rate.

We know, of course, that neither the worker nor his supervisor expects their action or lack of action to result in an accident. For example, the employee who runs on a slippery floor, falls, and is permanently injured—he did not anticipate the fall; or the employee who knowingly uses an ungrounded drill and is electrocuted. Why did these employees fail to anticipate the accident? Why did they take the risk? Why did supervisors let them?

Investigations of many thousands of accidents indicate that these acts are committed because people do not recognize and/or underestimate the risk of their action.

Therefore, it is evident that at the **WORK LEVEL** where 95 percent of the accidents occur, the first line

supervisor and the **WORKER**, if they are to control their accident problems, will need assistance. They must learn **TO BETTER RECOGNIZE, UNDERSTAND and CONTROL** the hazards of their jobs. They do not need someone to take over their work—merely to assist.

Basic principles of good leadership are violated when someone other than the first line supervisor takes over responsibility to control problems that should involve only the workers and their supervisors. When government, union, and management officials use their authority to solve problems of the first line supervisor—problems that he can solve himself with or without assistance—they do more harm than good. Such action makes no one responsible, confuses those concerned, and leaves safety problems unsolved. It is like using cannons to kill small birds—a great expenditure of energy for negligible results.

The only way to prevent accidents must be systematic and programmed, to assist the worker and immediate supervisor to discover the existing and potential hazards and just as systematically to better establish controls.

Conclusion

You may well ask what we can do about the thousands of accidents and injuries that result from well-meaning workers and supervisors who take chances without realizing the severity of the risk.

Doing what comes naturally in the field of safety may not be right—in fact, it can be very dangerous. Accident prevention depends on the ability of those involved with “work risks” to **RECOGNIZE, UNDERSTAND AND CONTROL THE HAZARDS OF THEIR JOBS.**

The responsibility for establishing the necessary safety training and hazard control procedures for any group of employees must be assigned to their immediate supervisor. The rest of us—the safety and industrial hygiene experts, the electrical, mechanical and chemical engineers, the psychologist, the trainer and other specialists—have one major responsibility . . . and that is to provide the first line management and other employees with the assistance and information they must have in order to identify and control the safety problems before they result in accidents. The back-up management must provide him with training, motivation, and control systems to insure program effectiveness.

The union back-up leadership must encourage its members to actively support the first line supervisor. Safety issues should not be labor relations pressure devices nor a means of personal gain for anyone. Safety matters should never be regarded as “union” or “management” activity; on the contrary, they should be regarded as mutual problems to be evaluated and controlled objectively.

The governmental safety agencies must intervene when the management or the unions fail for any reason to provide adequate safeguards on the job; and government has the responsibility to first enlighten and then enforce compliance to safety regulations.

The effort to prevent accidents will be far more effective and long lasting when the principles and the information reach, and are utilized by **THE WORKER AND HIS FIRST LINE MANAGEMENT.**

The rest of us must provide whatever guidance and controls are necessary to assist them to control the problem at the worker-foreman level—the right place to control it.



The State Fund safety services officer, John M. Inman, presides over a training class for safety consultants.

Training For Accident Prevention

State Fund gets results

**John M. Inman, Safety Services Officer
State Compensation Insurance Fund**

The State Fund's primary mission is to reduce to the lowest possible level industrial accidents in California, which are so costly in dollar losses and human suffering. To attain this objective the State Fund stresses the vital need for qualified professional safety consultants who fully utilize modern techniques and methods of accident prevention.

Modern, sophisticated techniques of problem solving are proving effective in preventing industrial accidents. Certain techniques adapted from economics, medical science or space exploration, like sequential analysis of basic needs, logical elimination of least-favorable alternatives, setting of realistic, measurable goals, and use of visible checkpoints and evaluation criteria, have brought about a new approach to accident prevention.

This doesn't mean that all the old methods are to be thrown out the window. Time-tested reliability strengthens well-established concepts with new vigor and values when the concepts are built into a framework of flexible attitudes and applications thrust ahead by concrete, measurable objectives and goals.

To utilize the full possibilities of these changing concepts of injury loss control, the State Fund uses an

analytical approach to policyholder accident prevention that has resulted in a new system of safety consultation service and safety program management. While "there is nothing new under the sun," the attitudes toward the proven concepts and the way in which they are combined and applied can result in markedly significant achievements.

Briefly, the State Fund's plan starts with men already skilled in accident prevention techniques, improves their analytical and technical skills, and then applies these skills to policyholder safety programming.

The second phase of the system consists of acquainting policyholders with the analytical approach and—together with the policyholder—implementing the new system straight through to evaluation and achievement. The most significant elements are "listening to needs" of the policyholder and being responsive to such needs in developing a program for accident prevention.

Consultants Development Plan

Now, let us go over the plan in a little more detail so the "hows" can be seen as clearly as the "whats." Skilled State Fund representatives attend a six-month course consisting of 600 hours of classroom lecture and problem solving with 840 hours of field study and application of techniques.

These sessions cover analytical research, program planning, accident trend analysis, leadership, motivation, oral communications, human relations, training techniques, resources utilization, industrial health hazards, machine guarding, and industrial techniques.

Professional instructors and consultants conduct the sessions using the latest techniques. The format of the course stresses development of skills derived from practicing concepts that combine academic knowledge and practical industrial application.

After class lectures, problem solving sessions and seminars, study and field application of techniques, the representative makes video tapes of himself in action so he can be critiqued by instructors and other class members, but most important of all, by himself. The participants soon come to believe constructive self-criticism improves effectiveness of the individual.

Following up the course is a program of regularly scheduled "continuing education" in more complete accident prevention techniques to insure steady growth in professional capabilities.

The intensive six-month course, under the leadership of John A. Sketchley, State Fund Assistant Vice President, places the Safety Representative in the role of consultant, better equipped to keep abreast of today's rapidly changing safety and business techniques, and better able to ascertain and recognize accident prevention problems—to pinpoint obstacles and plan to meet them before they can significantly affect the policyholder's pocketbook.

Supporting the Effort

State Fund Safety Consultants working in this way must have positive staff support to be effective. They must have accurate and timely knowledge of specific industry accident trends, of business fluctuations, and of current training modes. They must have workable "tools" to present to the policyholder to mold into his individualized safety program. Staff personnel from State Fund Safety Services, Marketing, Underwriting and Claims Rehabilitation Departments coordinate their information assimilation functions to facilitate this support.

A State Fund safety consultant, Paul Wood (right), visits a house construction site with a policyholder, contractor Walter Meinberger.



Today—in 1970—teams of the new breed of safety consultants and Safety Services personnel constantly review trends and problem areas, in order to establish responses to the changing and growing needs of modern industry. New techniques of safety programming are developed and implemented in rapid order after the need is recognized.

The formation of the support elements of an industry program are well illustrated in the recent development of the State Fund "Hospital Employee Accident Prevention Program," a large part of which is now being introduced and implemented throughout California for State Fund Policyholders.

During analytical surveys, conducted in a team approach by State Fund and the personnel of several policyholder hospitals, the unique accident problems of those hospitals began to loom as a target for a concentrated program. Simultaneous research being conducted by State Fund Safety Services Department staff specialists and other State Fund Districts throughout California clearly indicated a need for special support to hospital accident prevention programs. The several research projects came up with similar conclusions.

Hospital accident problems are unique to the industry, with differences in circumstances from one hospital to another but with certain very significant similarities at the same time.

Where one hospital had a rash of puncture wounds, it was seen as a lack of teamwork between departments; and where another had a rash of back injuries, it was seen as a lack of teamwork between individuals working together on the same job, like lifting a patient.

To combat this initial obstacle—the need for more effective teamwork—the State Fund, in cooperation with San Mateo County General Hospital, produced a 15 minute motion picture, "Hospital Safety Teamwork." The film establishes an axis for future accident prevention activities which would strengthen the overall hospital purpose.

Meanwhile, an active and thorough evaluation of the needs of hospital accident prevention was undertaken.

Inputs, in the form of activities, were determined that could most reasonably be expected to support the measurable goals as outcomes, and the State Fund began to move more deeply into hospital safety programming.

Specific motivational tools were developed, such as pamphlets concerning accident types and department special problems. Techniques were sampled for effectiveness as in the interdepartmental safety contests at Queen of the Valley Hospital in Napa. New motivational programs, like the new inter-hospital safety contest, were begun by the Hospital Districts' Association and State Fund.

Program elements are now available for our safety consultants adaptation with insured hospitals—as their analysis of each hospital's situation indicates, and as their, and the hospital's, mutual safety programming requires.

Some of the elements are:

Analyzing the Situation—Methods for examining and interpreting the records and the environment, choosing the best of several alternate systems, setting accident prevention goals, and a check-point system.

Organization—A hospital safety policy along with job responsibilities for safety coordinator, supervisors' committees, and committee members.

Hazard Reduction—Hazard checklists are provided for the various hospital departments. Job analysis forms are provided in which each step is analyzed for potential problem areas, and safety practices are developed to carry out each step in a safe and efficient manner.

Training—A series of lesson plans are provided covering Orientation; Safety; Teamwork for Safety; Lifting; Preventing Falls; Cuts, Lacerations and Punctures; and Departmental Hazards. These lesson plans utilize films, pamphlets and other audio-visual materials. Hospital supervisors are trained to carry out the training program as a basic part of their responsibility.

Promotional Activities—Elements to motivate employees to prevent accidents are provided. They include a contest and award system, an employee suggestion system, and guidelines for getting publicity for safety accomplishments.

Accident Recording and Investigation—Forms are provided for recording, reporting, and investigating accidents, together with suggestions for applying the results of such investigation to perfecting the overall accident prevention program. Departmental cost analysis is provided with accident type analysis.

Total Program Evaluation—Data and forms for a yearly review and evaluation of the results attained from the accident prevention program.

Resource Material—Tailor-made audio-visual materials are provided to support the program. These include posters, pamphlets, slides, and films for use in specific training and employee motivation.

As an example, we have in production at the present time a training package which tackles a hospital's most expensive injury problem, back strains. This package consists of an 18-minute, 16 mm motion picture on the safest way to lift patients, a guide for practicing the lifting of patients, a series of slides on the important steps of each major lift to use during practice, and a follow-up brochure on patient lifting to use as a recall device. The Contra Costa Medical Services patient lifting team, which appears in the movie and slides, and the State Fund gathered information from 17 different hospitals to arrive at the procedures shown in the film.

To summarize, this industry-wide total hospital program was built by its users. They, in turn, use it in as many different ways as there are hospitals, and hospitals reap as many expressions of the analytical approach in dividend dollars.

In the last analysis, we can see that this new brand of accident prevention service succeeds because it offers accident need analysis without guesswork, safety programming without assumptions, progress that is measurable, and dividends that multiply, in the State Fund's continuing efforts to reduce monetary losses and human suffering resulting from occupational injuries.

First Aid Care

. . . fifth in a series

Wounds and burns

**E. F. Allen, Safety Representative, Health and Safety Activity
Bureau of Mines, U. S. Department of the Interior**

After care has been administered for the conditions of the human body requiring first aid that were described earlier in this series, attention should be directed to caring for any wounds the victim may have. An open wound is any break in the skin. When the skin is intact, it provides protection against most infection caused by bacteria, viruses, fungi, etc. However, when the skin is broken, even slightly, germs may enter and infection may develop. Any wound where the skin is broken should receive prompt medical attention, and preferably sterile objects should be in contact with open wounds. Statistics indicate that about 5 percent of open wounds show evidence of infection, and when these wounds are not treated properly, the rate of infection is nearly doubled. An open wound in addition may be the surface evidence of a more serious injury to deeper structures, such as fractures, particularly in head injuries involving fracture of the skull.

Open Wounds

Open wounds are divided into four classifications. **ABRASIONS**—Abrasions are wounds caused by rubbing or scraping. These wounds are seldom deep, but a portion of the skin has been removed, leaving a raw, bleeding surface. The bleeding in most abrasions is from capillaries only, but infection is easily induced owing to the extensive area of underskin exposed.

INCISED—Wounds produced by a sharp cutting edge, such as a knife, rock, piece of glass or metal, or similar object, are incised wounds. The edges of such wounds are smoothly divided without bruising or tearing. Incised wounds usually bleed freely, which tends to cleanse the injury. These wounds are not as liable to infection as wounds of other types; however, they should receive prompt medical attention.

LACERATED—Lacerated wounds are those with ragged edges where the skin has been torn or crushed by blunt instruments, machinery, or other rough surfaces. Blood vessels may be torn or crushed, and usually do not bleed as freely as those damaged by incised wounds. Ragged and torn tissues, in combination with foreign matter that is often forced or ground into the injury, have a higher incidence of infection than is usually experienced with incised wounds.

PUNCTURED—Wounds of this type are caused by pointed objects, such as needles, splinters, nails, or pieces of wire. Such wounds usually are small and deep, and bleed very little. The object that causes a puncture

wound may be soiled, and matter causing infection is often embedded deeply in the tissue. The small opening in the skin and the few blood vessels severed prevent free bleeding, and make the danger of infection in this type of wound far greater than in other types. Should the tetanus germ be present and become embedded in the flesh, lockjaw may result. This disease is extremely serious and may cause death. The services of a physician should always be obtained for puncture wounds, and his recommendations regarding immunization should be followed scrupulously.

The primary responsibility of first-aiders in treating open wounds is to check hemorrhage. Further contamination of the injury should be prevented. The area should be exposed so that the injury may be seen, and loose foreign objects should be removed by wiping them away from the wound with sterile gauze or other sterile material. First-aiders should not attempt to remove embedded objects. Leave this treatment to the doctor as it may assist him in determining the extent of the injury and the involvement of deeper parts. In addition, attempts by first-aiders to remove embedded objects may rupture blood vessels or damage nerves, compounding the injury.

Dressings

Water, drugs, or antiseptics should not be used on a wound unless this is company policy, and proper authority assumes responsibility and gives directions for their use. The wound should not be touched with the hands, clothing, or anything that is not sterile. Instead, the wound should be bandaged to control bleeding, provide protection, prevent further contamination, and conceal the injury from the eyes of the victim. Extreme care should be taken to make all dressings wide enough to completely cover the wound and at least a small area surrounding the injury. Knots should be tied directly over the wound to help control bleeding, except wounds to the head and eyes, where an object is embedded in the wound, and where a bone is protruding from the wound, or where a fracture is suspected.

Bandages should be applied firmly, but never tightly. A too tight bandage will interfere with the blood supply and cause discomfort, or result in a more serious condition. In bandaging the arms or legs, the tips of the fingers or toes should be exposed where possible. This permits easy examination to determine if circulation has been cut off. It should be remembered that swelling frequently follows an injury, and a tight bandage may become increasingly tighter. Should the patient complain, the bandage should be loosened slightly, but it should be kept snug. A wet bandage should not be applied except for treating burns.

It is not necessary to know how to apply a fancy bandage, because a first-aidер should be concerned primarily with its purpose, not its looks. Nevertheless, when a person has received instruction and practice in the proper ties, he will have greater confidence in his ability as a first-aidер.

Closed Wounds

Several types of injuries, such as bruises, strains, and sprains may occur where the skin is not broken, but damage occurs to deeper tissues. These injuries are usually classed as closed wounds.

Bruises are generally caused by having the body struck by some blunt object which may not break the skin but

does rupture blood vessels that subsequently produce swelling and discoloration of the affected area. First-aid treatment consists of applying cold applications, such as an ice bag or a towel wrung out in cold water, elevating the injured part, and providing complete rest. The injured area should be examined carefully for possible fractures, dislocations, or other injuries.

Strains result from the overstretching of a muscle or tendon. In severe strains, the fibers forming the muscle or tendon may be torn. A sharp pain or cramp is usually felt, making any attempt to use the muscle difficult and painful. Swelling may also occur. The victim should be placed in a comfortable position; and hot applications, preferably dry heat, should be applied to the affected area. The area should be massaged to stimulate circulation and prevent venous congestion, and it may be rubbed with alcohol to relieve pain. The part should be kept at rest. Strains can be prevented if a person will use intelligent judgment when lifting and moving objects. Persons should lift properly, using the strong muscles of the arms and legs, not the back muscles, and they should avoid lifting heavy weights that are beyond their capabilities.

Sprains are injuries due to stretching or tearing the ligaments or other tissues surrounding a joint. They may be minor in nature and cause pain and discomfort for only a few hours, or they may be severe enough to require many weeks of medical treatment before restoration to normal use. Symptoms are pain and swelling around the joint, followed by discoloration. The joint should be left at absolute rest in an elevated position; and initially cold applications should be given to relieve pain. The joint may be bound firmly with a bandage, but as swelling progresses it may be necessary to loosen the binding to keep the victim comfortable. Because of the swelling resulting from most sprains, it is difficult to determine if the joint was dislocated, or if a nearby bone was fractured. Such cases should receive medical attention, as they require an X-ray examination to determine the extent of the injury. If in doubt, first-aiders should treat the injury as a fracture.

Burns

Burns are probably one of the greatest causes of injury and death in the home and are often a cause of lost-time injuries in industry. Causes of burns are dry heat, fire, electricity, friction, hot solutions, steam and vapor, and chemicals, such as strong acids or alkalis. Many burns from these causes could be eliminated if proper precautions were taken in our daily lives, especially in the case of children.

Burns are classified by the degree of injury to body tissue. The outer skin is reddened and slight swelling exists in first degree burns; the under skin is affected and blisters are formed in second degree burns; and the skin is destroyed and some of the tissue damaged in third degree burns. In severe cases, muscles, nerves, and blood vessels may be destroyed and the entire area charred. The seriousness of a burn or scald is influenced by the extent of the body surface involved and the depth to which the tissues are penetrated. Shock is very severe when burns are extensive, and may cause death in a few hours.

Emergency or first-aid treatment of burns or scalds is primarily excluding air from the burned area; relieving the pain that immediately follows burns; preventing or minimizing the onset of shock and, if it occurs, giving

prompt and effective treatment; and preventing infection. Remove all clothing from the injured area, but cut around any that adheres to the skin and leave it in place. Keep the patient covered, except the injured part, as there is a tendency for chilling. As soon as the burned or scalded area has been exposed, cover it with a protective dressing and a loosely applied cover bandage. Use reasonably clean material that has been moistened in cold water for dressing burns and leave application of medication to the attending physician. Never permit burned surfaces to be in contact, such as areas between fingers and toes, the ears and the side of the head, the undersurface of the arm and the chest wall, the folds of the groin, and similar places. Separate these places with burn dressings. A new treatment consists of covering burn areas with ice or an ice pack. Ice applications will moisten the area, exclude air, and assist in relieving pain. Never use substances that are greasy or oily or cannot

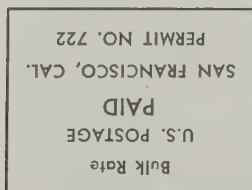
be removed easily with water on a burned surface; never break blisters intentionally; and always lift the patient from the least injured side, being careful not to touch the burned area.

Chemical burns should be thoroughly washed with water to dilute the chemical. Usually 5 minutes or more of washing with a continuous stream will suffice and a burn dressing can be applied. Should chemical substances strike the eye, have the victim lie down, hold his eyelids open with the fingers, pour water into the inner corner of the eye from a pitcher or similar container, and flush thoroughly, making certain the water actually flows across the eye. Never use neutralizing solutions in the eye. Burns to the eye should receive the attention of an eye specialist as quickly as possible.

TO BE CONTINUED

**Final issue: Fractures, Dislocations, and Transportation,
Sixth of a Series.**

(Note: Address below is reversed to permit automatic feeding of the addressograph machine.)



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SAFETY NEWS

STATE OF CALIFORNIA
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HUMAN RELATIONS AGENCY
Lucian B. Vandegrift, Secretary

DEPARTMENT OF INDUSTRIAL RELATIONS
William C. Hern, Director

DIVISION OF INDUSTRIAL SAFETY
Jack F. Hatton, Chief

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RESEARCH AND EDUCATION
J. Robert Signer, Supervising Engineer
Gene Cresci, Editor
Marjolaine O'Neill, Graphic Artist

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- 18 First Aid Care—Physical shock.



Chiefly speaking

Statistics are the commonly accepted way that we in safety can learn about accident trends, or test how effective our programs may be, or broadcast successful accident prevention.

We also use numbers for their objectivity. They are without bias and can tell a story without emotion.

For these reasons, let me detail some numbers relating the story of the State Division of Industrial Safety in the past decade. Here is a tabulation of staff and basic Division functions at the beginning and end of the 1960's:

	1960	1969	Percent increase 1960-69
DIS Field Engineers.....	150	194	+29
Original Inspections by DIS Field Staff.....	104,000	141,000	+36
Unsafe Conditions Corrected....	187,000	250,000	+34

The Division was compiling this record during the decade while size and complexity of California industry were changing markedly. The numbers showing this change are closely related to the Division of Industrial Safety's operation, and it is important at least to know the following partial list:

	1960	1969	Percent increase 1960-69
Employees Covered by Workmen's Compensation.....	4.9 million	6.9 million	+41
Number of Workplaces (reporting units under unemployment insurance) (1st quarter) (1st quarter)	292,275	332,049	+14

There are, furthermore, many numbers to show the kinds and complexities of California industry in the 1960's, scat-

tered throughout 158,693 square miles. Significant for safety men is the size of firms throughout the State. More than 95 percent of the State's industrial firms (units reporting under provisions of the California Unemployment Insurance program) employ fewer than 50 workers, as shown by the following:

Number of employees	Industrial Firms (percentage distribution) 1962 (3rd quarter)	1968 (3rd quarter)
Total	100.0 percent	100.0 percent
0-3	56.2 "	52.6 "
4-9	24.0 "	25.4 "
10-19	9.8 "	10.5 "
20-49	6.3 "	7.1 "
50-99	2.1 "	2.4 "
100-249	1.1 "	1.3 "
250-499	0.3 "	0.4 "
500-999	0.1 "	0.2 "
1000+	0.1 "	0.1 "

Closely related to the above numbers is the job injury rate. It declined slightly during the decade, down from 32.1 disabling injuries per 1,000 workers in 1960 to 30.9 in 1968 and 31.6 in 1969.

What conclusions may we draw from all these numbers? First of all, the 41 percent growth of the work force with its share of new or unskilled workers presented myriad problems for safety enforcement and accident prevention. It is also undeniable that despite a slight increase of average employment per firm, the great bulk of the firms continued to be small ones—sometimes hard to reach with accident prevention messages and safety guidance.

It is also clear from the numbers I first presented that the State Division of Industrial Safety kept ahead of California's changing industrial story in the 1960's. Over the decade the Division's staff established an impressive record of in-plant inspections and the correction of unsafe conditions.

The Division had a busy decade, and in view of the relatively low job injury rate, I believe that decade was a successful one for us. Thousands of workmen who escaped injury or death are the best measure of that success. May the decade of the 1970's multiply many times that kind of number.

Jack F. Hatton

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Photo Highlights of 1970 GISC



The 1970 Governor's Industrial Safety Conference attracted nearly 1,400 registered delegates to its general sessions and section meetings held in the Sheraton-Palace Hotel, San Francisco on February 5 and 6. Photographs on this and the following pages review highlights of the conference and show many of the key participants. Governor Ronald Reagan is shown at left signing the proclamation of Industrial Safety Week, February 1-7. With the Governor are (left to right): Ralph McConnell, safety superintendent of Kaiser Steel Corporation, Oakland; Richard K. Humphries, safety consultant and member of the State Industrial Safety Board; and Jack F. Hatton, Chief of the State Division of Industrial Safety. The conference was opened in the hotel's Grand Ballroom (shown above), where delegates heard a principal address by N. J. Ryker, vice president, space division, North American-Rockwell Corporation, Downey.



Lieutenant Governor Ed Reinecke, in his address at the closing luncheon of the conference on February 6, summed up the work of the conference and praised delegates for their achievements in accident prevention during 1969. With the lieutenant governor in the photograph above is William C. Hern (right), Director of the State Department of Industrial Relations and General Chairman of the GISC. Shown top right is Jack F. Hatton, Chief of the State Division of Industrial Safety, as he reviewed the record of his division, in a speech to the General Assembly on February 5. He preceded the address of J. D. Hodgson, U. S. Under Secretary of Labor, who discussed the economic impact of industrial injuries and fatalities and described the pending Federal legislation relating to occupational health and safety.

The group photographs on pages 5 and 6 are of the conference's principal organizers and the sections for which they planned the programs.



Agriculture: Willard L. Pippitt, DIS conference consultant; Miles W. Kratka, cochairman; John O. Barnes, DIS conference consultant. (Not shown: cochairmen Cliff H. Jameson, John A. Lewis, and Frank E. Thompson.)



Construction: Willis Pugh, DIS conference consultant; Gary H. Bronneck; cochairmen Leo R. Westwater, George Zack, and Edmond J. Gale; Robert Jinkens, DIS consultant. (Herbert C. Ball, cochairman, not shown.)



Forest Products: Foster W. Morrison, cochairman; Thomas H. Batterton, DIS conference consultant; Homer Bryant, cochairman.



Governmental Agencies: Fred Hull, DIS conference consultant; cochairmen Harold S. Eldredge, J. D. Jefcoat, and James Slatton. (Grant Kingon, DIS conference consultant, and Jerry Costa, cochairman, not shown.)





Manufacturing: Ralph McConnell, cochairman; John Chocholak, DIS conference consultant; Merritt Merrill, cochairman; Henry A. Hartmann, DIS conference consultant. (Cochairmen not shown: Al Arismendi and Chester McCloskey.)



Mineral Industries: Larry L. McCune, DIS conference consultant; cochairmen Andrew C. Christensen, Dale Marr, and Silas L. Yount; Robert D. Bailly, DIS conference consultant. (Cochairman not shown, Thomas H. Cole.)



Trades and Services: Harold K. Goddard, DIS conference consultant; cochairmen Jack V. Evans and Bertha Metro; Emlyn L. Cox, DIS conference consultant. (Thomas L. Macnair and Richard C. Vasquez, cochairmen, not shown.)



Transportation, Communications, Utilities: Andrew T. Brozik, DIS conference consultant; cochairmen Ronald T. Weakley, Robert W. Rivers, and Stan A. Ossman; Haril Whetsell, DIS conference consultant; Carl E. Pulliam, cochairman.

Revisions proposed for 1963 standards

William W. Steffan, Senior Health Physicist

Environmental Engineering Unit, State Division of Industrial Safety

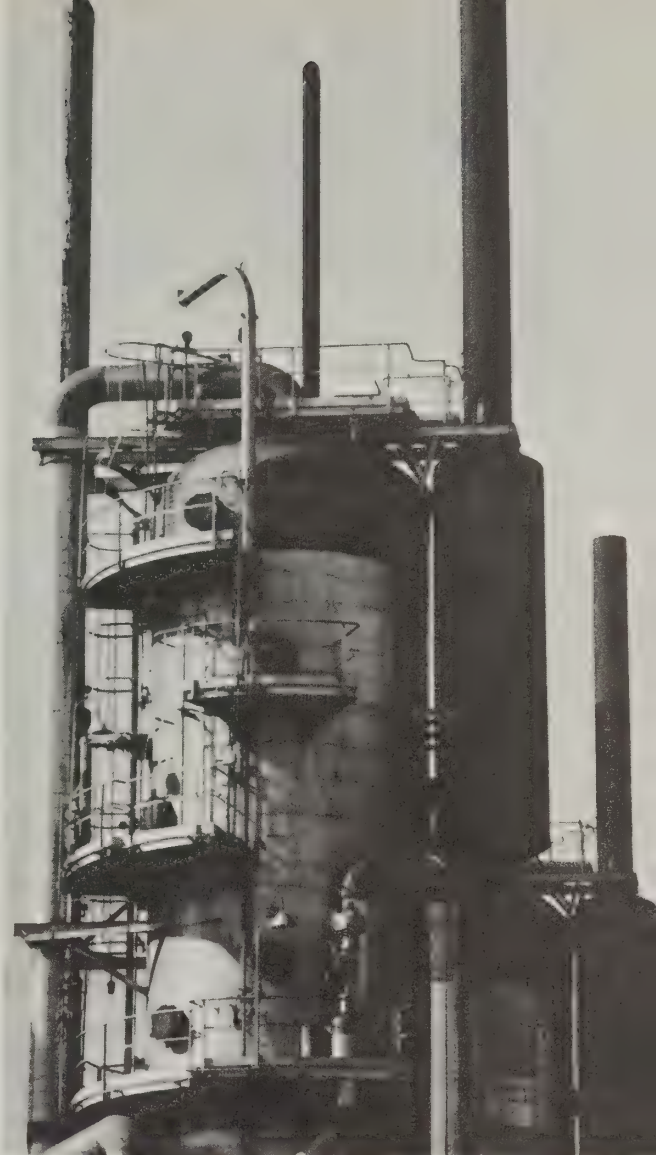
There is a great deal of information relating industrial noise levels to hearing loss, but there are many problems in trying to interpret the data. There are large differences in damage to individuals receiving the same noise exposure; there are exposures to individuals not known to the researcher; and there are variations in processes over many years which cannot always be considered in gathering the data. However, despite difficulties in finding the threshold of hearing impairment, there is no doubt that exposure to loud noise for long periods will produce serious inability to understand speech.

California enforces noise control regulations, based on standards adopted in 1963. Last year the Federal Bureau of Labor Standards adopted comprehensive noise regulations for the first time. How do the Federal standards compare with this state's standards? Before directly comparing the two, the background to California's regulations should be understood.

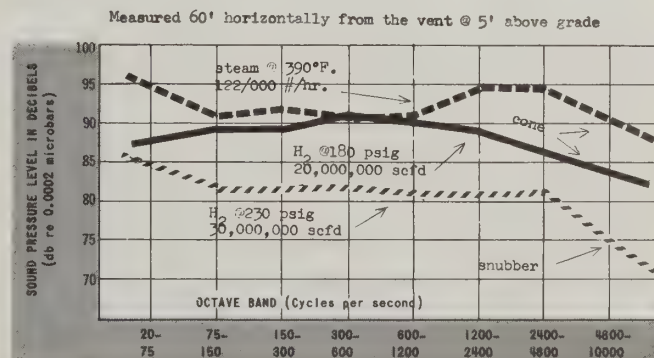
In 1960 and 1961, it became apparent that the number of hearing loss cases before the Workmen's Compensation Appeals Board in California was increasing; in 1955, for example, the Board decided 86 cases involving hearing loss; in 1959, there were 186 cases; and in 1963, the year California's regulations were passed, there were 373 cases. To even the casual observer, this appeared to be a startling increase; the informed practitioner, who had run audiometric tests on persons working in noisy jobs, feared that the compensation insurance companies and the self-insureds would be bankrupt by an avalanche of claims if laws were written to control noise. These fears have not come to pass; in fact, cases have not exceeded 373 in any year since 1963.

The fears, however, were real in 1961. At our first hearing that year at which we proposed noise control regulations at 85 dB (decibels) in the higher octave bands, about 1000 people appeared at what has to be described as a controversial meeting. As a result of this meeting, a group called the "All Industry Noise Committee" was formed. Representatives of this group and other interested parties worked with Division engineers to develop California's regulations. These were heard at public hearings conducted by the California Industrial Safety Board and were adopted. The serious (high noise level) problems could be solved immediately using the adopted standard, and the controversial borderline cases (intermediate and low noise levels) would be set aside temporarily, which seemed reasonable. At these lower noise levels, more than ten years of exposure would be required for hearing impairment, except in a few very sensitive individuals.

The present California regulations are basically an octave band standard set at 95 dB in the frequencies above 300 cycles per second. A somewhat higher noise level is permitted at the lower frequencies. Where these



Standard Oil Company of California for many years has worked on engineering controls for noise. Among the largest are these silencers at Standard's Richmond refinery. They are the wide sections of the darker venting stacks at the right of a large steam methane reforming plant for hydrogen production. The snubbers are 24 feet high, and with the 28-foot stack weigh about 5,000 pounds. Cost to replace the regular discharge cone with a snubber was about \$15,000, not including design and engineering. The graph below compares sound levels measured at the discharge cone before changeover and then after installation of a snubber.



noise levels are exceeded, engineering controls must be instituted to the extent practicable to reduce the noise to safe levels.

Where engineering controls are not feasible or are inadequate, "acceptable" ear protectors must be worn. To be acceptable, ear protectors must be safe to wear (they would not cause damage to the ear if struck from the side), and be made of material which will not cause dermatitis or leave pieces of potentially harmful material in the ear. They must attenuate noise effectively and be tested by an independent testing laboratory in accordance with ASA standards (now American National Standards Institute).

There is also provision to permit higher noise levels for exposures of less than five hours a day. For example, if the exposure does not exceed two and one-half hours a day, noise levels up to 98 dB would be permitted.

The Walsh-Healey Safety and Health Standards for Federal Supply Contracts were revised considerably in January, 1969 by the outgoing Secretary of Labor, Willard Wirtz. The regulation was held up for review for three months by the incoming Secretary of Labor, George P. Shultz and, after some amendments, was adopted and made effective May 20, 1969. A major controversy involved the section on occupational noise exposure. The original regulation submitted for comment in September, 1968 set the allowable level at 85 dBA (decibels on the "A" scale) and made engineering control the only method of control. This was modified somewhat before being adopted in January by Secretary Wirtz: Ear protectors were permitted after engineering controls were tried and found inadequate; the level was also raised temporarily to 92 dBA for one year, after which it would return to 85 dBA.

The final version adopted by Secretary Shultz appears to be much improved. The allowable noise level is 90 dBA; engineering controls are to be used where feasible; and personal protective equipment is to be used where engineering controls are not adequate. A continuing effective hearing conservation program is required where noise levels exceed the standard. Impact noise should not exceed a 140 dB peak sound pressure level.

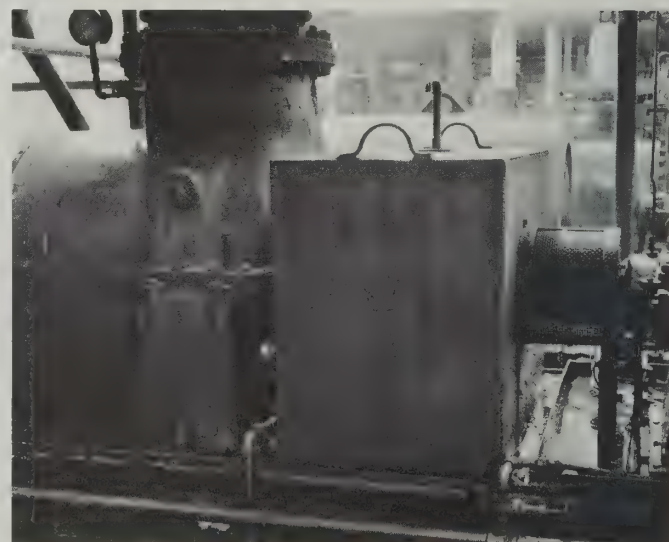
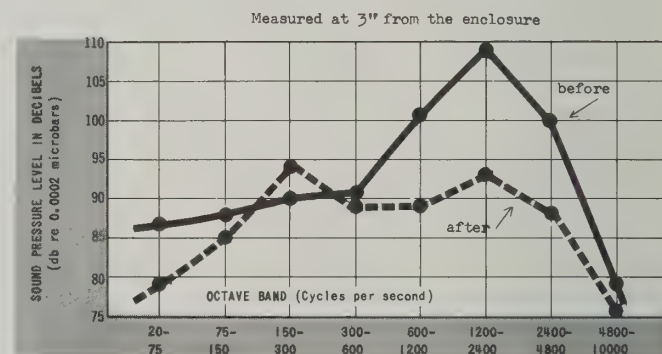
What does the future look like for noise regulation in California? First, with respect to Walsh-Healey, California is an agreement state, and compliance with our regulations is, in effect, compliance with Walsh-Healey. So, until our noise control regulations are revised, the Walsh-Healey changes will not be felt in California. Possible exceptions are some service contracts under the McNamara-O'Hara Act which requires the use of consensus standards, such as Walsh-Healey.

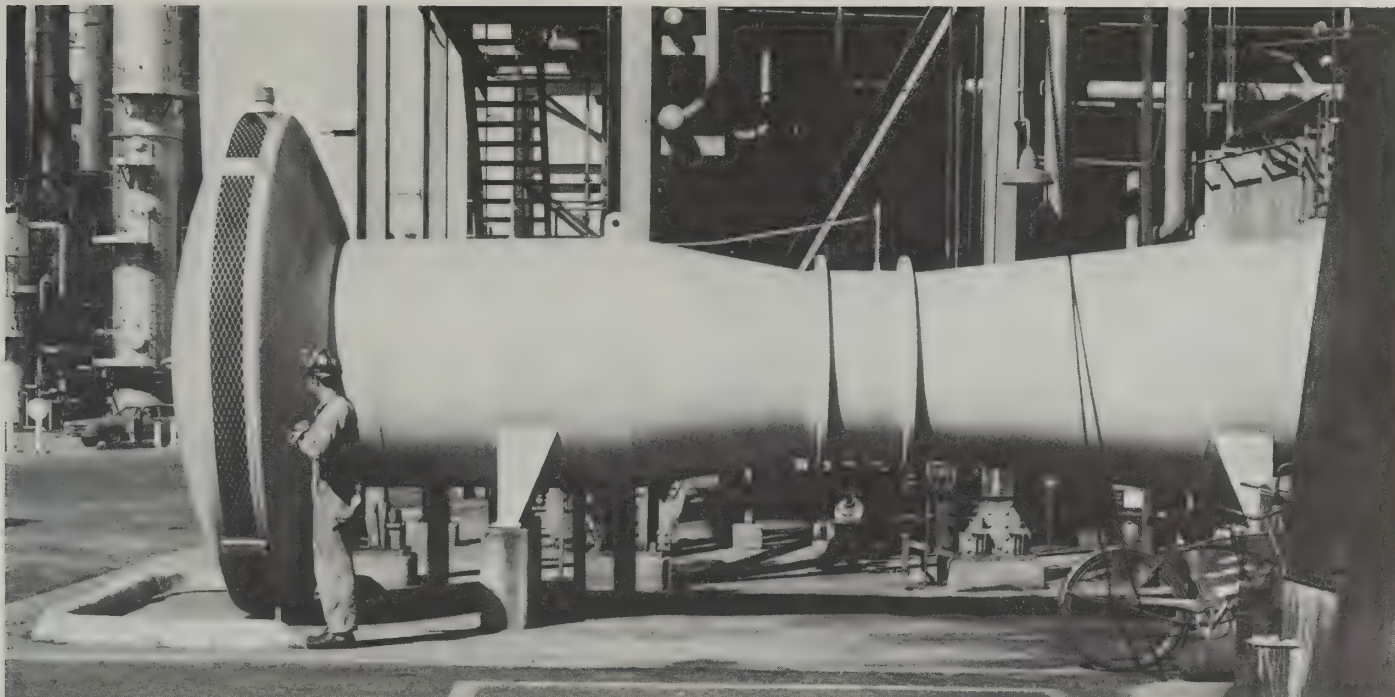
Figure 3 on page 11 compares the present Division of Industrial Safety regulations and the CHABA (Committee on Hearing and Bioacoustics of the National Research Council) equinoxious noise contours, which were placed in the Walsh-Healey regulations to permit the conversion of octave band data to dBA. The Division of Industrial Safety standards for exposures of five hours and for one-half hour are superimposed. You will note that for one-half hour per day, exposures at 2000 to 4000 Hz (cycles per second) are about the same as the CHABA data, whereas at higher and lower frequencies, the D.I.S. requirements are much more restrictive. For exposures of five hours or more a day, the Walsh-Healey requirements are more restrictive, except at the very low frequencies where they are about the same.

There are two typical octave band noise spectra plotted on this figure. One peaks at 500 Hz and 101 dB; the meter reading for this spectrum is 99 dBA; the conversion you get from use of the chart is 95 dBA. The other curve peaks at 4000 Hz and 90 dB. The meter reading is 94 dBA, and the conversion is 95 dBA, using the curves. Using the octave band analysis and the equinoxious noise contours should give the most accurate results. The conversion to dBA and thence to allowable time is an extra step, since the allowable times could have been plotted directly as in Figure 3 (see page 11).

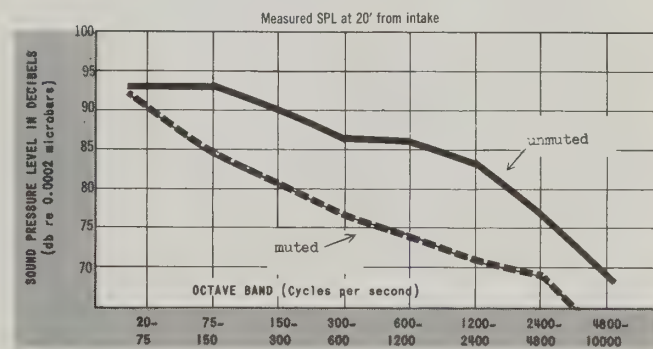
We are in the sixth draft of revisions proposed for California's noise control regulations. The target date for public hearings is mid-1970.

This is another example of engineering controls of noise at Standard Oil Company's Richmond refinery (shown in the photo at the bottom of the page). The welded steel box covers a speed changer coupled to a pump at the left and a steam turbine at the right (out of photo). The box is 3/16" thick and lined with 1" fibreglas supported by a wire mesh screen. The enclosure rests on a 1/8" neoprene gasket to reduce noise levels caused by mechanical vibration. Total cost was about \$300. Engineering data on effectiveness of the noise control measured before and after installation is shown in the graph below.



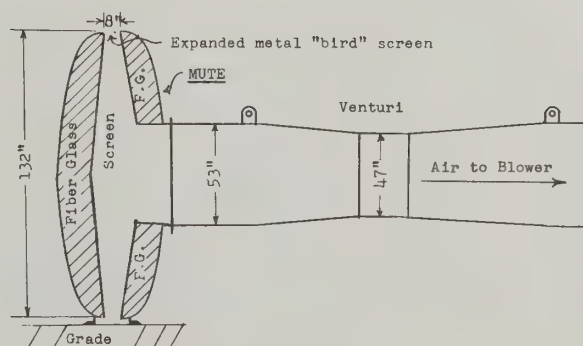


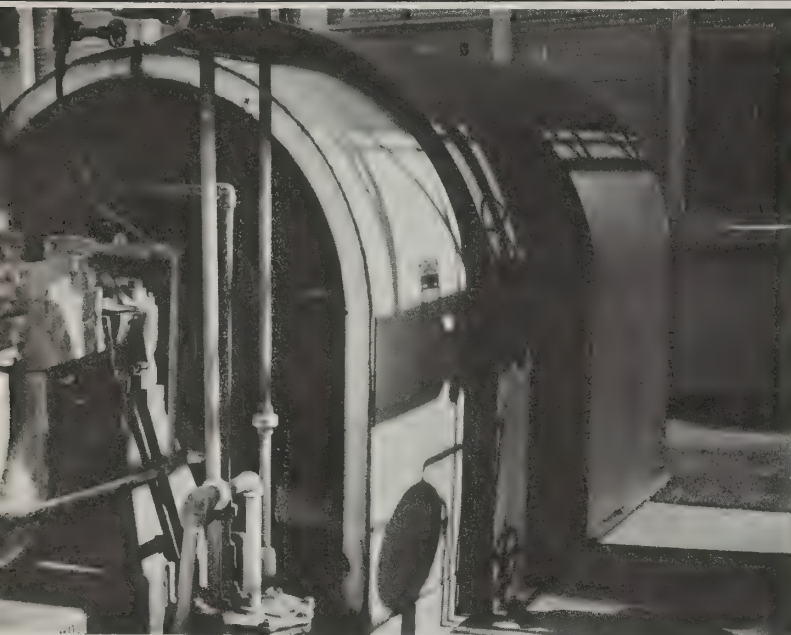
At Standard Oil Company's El Segundo refinery, noise controls were installed on a horizontal air intake for a blower fan driven by a turbine through a reduction gear. The bell-mouthed intake section was replaced with a suction mute, shown above and in the schematic drawing at right. Cost exclusive of engineering and design was about \$8,000. Engineering data on noise levels before and after muting are shown in the graph (below, right).



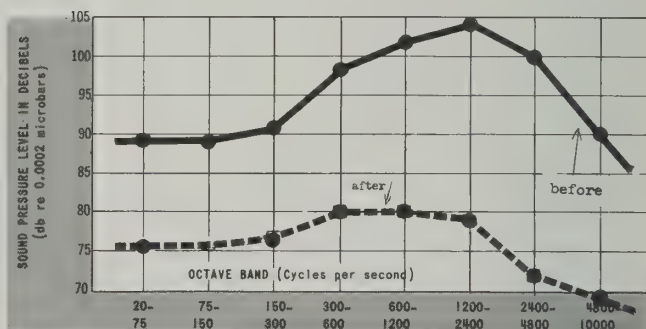
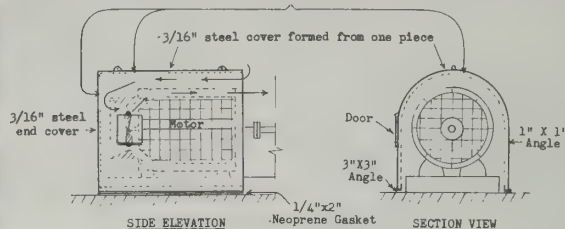
As presently conceived, the standard would be 90 dBA for eight hours a day with higher levels permitted for shorter periods. Where these exposure levels are met by controlling the noise, no other obligation would exist.

Where exposures cannot be controlled, personal protective devices acceptable to the Division would be mandatory and an effective hearing conservation program would need to be provided. Octave band analysis would also be permitted under certain conditions, and impact noises would be controlled. The impact noise criteria, as well as instrumentation to measure impulsive noise, are still a major concern of the committee drafting the proposed revision.





1" thick Johns-Manville fiber glass "Microbar" duct liner strapped and bolted in place



Age, Exposure, Noise Intensity

Key factors in hearing impairment

What is impaired hearing? One approach to answering this is to look at the California Workmen's Compensation Schedule for Rating Permanent Disability for Hearing Loss. A loss of 82 dB based on audiometers calibrated to ASA-1951 or 92 dB based on ISO-1964 in the 500, 1000, 2000, and 3000 Hz (cycles per second) frequencies is total loss of hearing for rating purposes. Partial loss is computed by averaging the loss in each ear for these four frequencies, subtracting 15 dB where ASA-1951 audiometers are used (25 dB where ISO-1964 audiometers are used) and multiplying the remaining loss by 1.5 to obtain percent loss. For example, if the average loss in the four test frequencies is 30 dB (ASA), the compensable loss would be

$$(30-15)(1.5) = 22\frac{1}{2} \text{ percent}$$

If most of the damage is to one ear, the loss is calculated by adding the loss in the bad ear to five times the loss in the good ear and dividing by six. If only one ear was damaged with a loss of 22½ percent, the compensable loss would be reduced from 22½ percent to 4 percent.

Probably the simplest statement showing hearing impairment for exposed and non-exposed persons for various age groups is shown in Figure 1¹ which was published by the Intersociety Committee on Guidelines for Noise Control. Here, impaired hearing means loss of 15 dB at 500, 1000, and 2000 Hz.

When persons reach their sixth decade, even with no noise exposure, 20 percent will have impaired hearing. Exposures to 85 dBA would increase this percentage from 20 to 25 percent. This may seem to be a serious matter unless you look at what happens to each individual in the population. In general, they each lose a couple more dB of hearing. Those who would have lost 13 dB, now have lost 15 dB and have "impaired hearing." This is considerably different than saying, "We now have 5 percent more deaf people." A 2-dB loss in hearing acuity would not be noticeable and would be almost impossible to detect in an individual. What this table does not show is that at the higher noise

¹AIHA Journal, Sept.-Oct. 1967, P. 419: "Guidelines for Noise Exposure Control."

The enclosure shown in the photo (far left) was designed and engineered to reduce noise from a double shell squirrel cage induction motor, at Standard's Richmond refinery. The enclosure was left open at the shaft end, but the side toward the control room at rear was closed off. Before the changeover, workers in the control room offices were subjected to speech interference. Sound levels in the graph (left) were measured, before and after the enclosure was installed, with microphones 3' from the fan intake end of the motor and 3' from the sides of the motor. Materials and labor for the enclosure were about \$550.

The California Safety News is indebted to staff industrial hygienists and others at Standard Oil Company of California for making available the photographs, line drawings, graphs, and other data relating to engineering controls of noise by Standard Oil.

PERCENT WITH IMPAIRED HEARING BY AGE

NOISE LEVEL dBA	20-29	30-39	40-49	50-59	SAMPLE SIZE
No Noise	3	5	10	20	2282
General Population	2	5	14	24	20,459
85	2	8	15	25	1100
92	3	9	15	28	9653
95	8	15	25	38	1092
96	3	10	19	-	1834
97	7	22	32	48	400
102	10	18	30	45	666
104	5	21	35	57	174

Figure 1

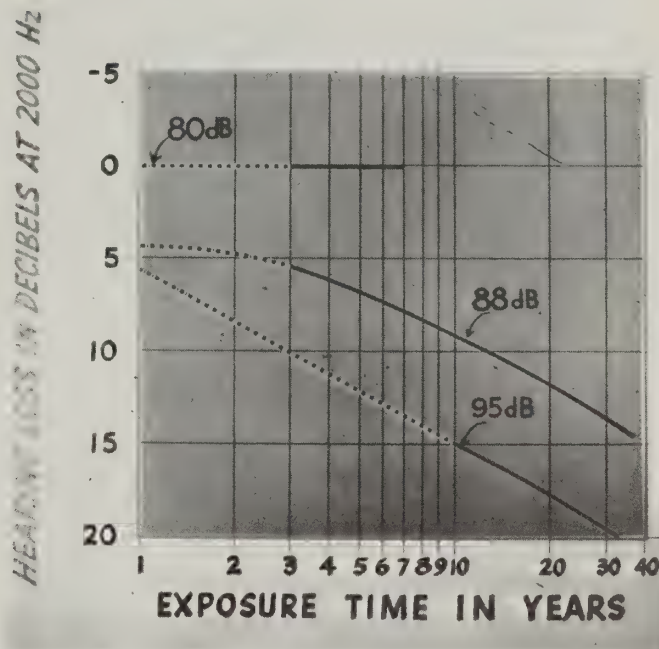


Figure 2

levels, individuals lose more of their ability to understand speech, so that we have not only more people with impaired hearing but greater impairment as the levels increase. In tunnels, it is not uncommon to find noise levels near the jumbo drilling rigs in excess of 120 dB; young men hired locally could permanently lose their hearing in the six months or so they were employed. You can imagine the difficulty such persons would have working in a small, quiet community after the tunnel is completed.

Figure 2² shows the "net" hearing loss at 2000 Hz for persons exposed to various noise intensities for increasing lengths of time. This is a semi-log plot, and the 95 dB net loss is almost a straight line, which indicates that the hearing loss due to noise is at any time proportional to the amount of hearing yet to be lost. For example, an average man exposed for 35 years to 95 dB would have a loss of 20 dB due to noise. After the first ten years of exposure, his loss would be 15 dB; however, during his last 10 years he would lose only 3 dB.

² Z24-X-2, P. 32: "The Relations of Hearing Loss to Noise Exposure."

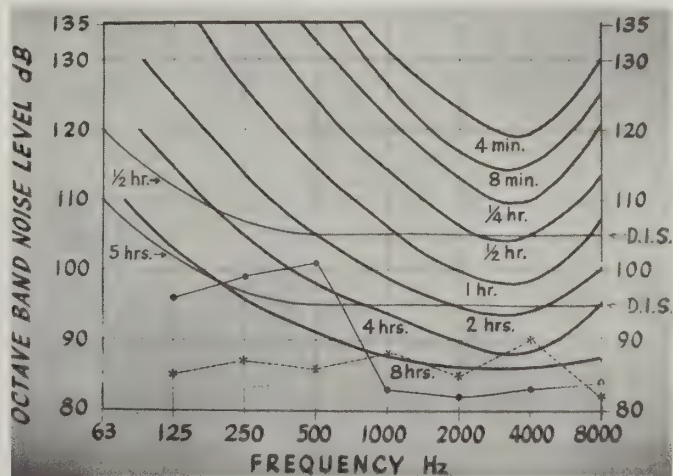


Figure 3

There are alternative solutions for the industry's problems

**Ken Nobs, Industrial Hygiene Engineer
State Division of Industrial Safety**

The standards used to determine if the hazard of noise-induced hearing loss is present in industrial operations in general are thoroughly discussed in the accompanying article by William Steffan.

By these standards, how much of a problem is noise in mining and quarrying? Table I shows noise levels in dBA of some typical mine and quarry equipment. Just where the noise level falls in the ranges shown depends on the size, power, condition of the equipment, and, in the case of the rock drills, the type of ground drilled.

Note that only the electric shovel falls below the magic number of 90 dBA. However, most of these numbers are meaningless unless we take into consideration the length of exposure. For the U.G. rock drill, the allowable time would be $\frac{1}{2}$ hour at 110 dBA, and any exposure to 115 dBA or over regardless of how short would require protection. Actual length of exposure to rock drill noise is easy to calculate, especially if more than one machine is drilling. In this same category would also be exposure to noise from fans, compressors, screens, washers, and, to a certain extent, crushers. All of these can be classified as continuous noise of fairly regular intensity. With other equipment, such as mucking machines, slushers, dozers, shovels, front-end loaders, and trucks, it is difficult to determine the actual length of exposure, because the noise is not only intermittent, but variable in intensity. However, if we look at the ranges shown in Table I for this type of equipment, we find that at the upper limit allowable exposure for one day would be less than one hour. While we may not know exactly how that time is distributed over the shift, we do know from a practical point of view that if the equipment is working near its potential, the length of exposure will probably be considerably longer than one hour. In any event, the exposure is there, and heavy equipment operators continue to lose their hearing. Figure I shows results of a joint study made by U.S. Public Health Service and the California State Department of Public Health covering heavy equipment operators in the Central Valley in the summer of 1966. These were reported by Dr. Thomas Milby and Dr. Fred Ottoni of the California Department of Public Health. The workers were divided into groups by age, and their hearing was compared to a control group of non-exposed men in the same age bracket. We see that in the youngest

group, equipment operators' hearing loss at 4000 Hz is 11 dB greater than the control group. This increases to a difference of almost 30 dB at the same frequency for the oldest group tested. I don't have similar data for underground miners who have been running machines all the time. If I did, I think it would scare us all to death.

From all this it is clear that we undoubtedly have a problem; so what do we do about it?

First of all, every employer must define his own particular noise problem. He should secure a sound-level meter and check just how noisy his operations are. For assistance with such checks, call a Division of Industrial Safety safety engineer.

Once this information has been obtained, the employer should evaluate his operation to see if administrative control of the noise exposure is practical. Administrative control as an alternate to engineering control recognizes the benefit of alternating high-level noise exposure with periods of relative quiet. This might be accomplished administratively by adjusting the work cycle without the necessity of actually reducing the noise level by engineering control. The possibilities here are unlimited for beneficiation plants and sand and gravel plants. It is usually practical for them to set up a quiet enclosure where operators may spend part of their time without jeopardizing the operation.

Look into engineering control that would reduce the noise at the source. Such controls are best accomplished

Equipment	Noise Level Decibels (dBA)
Pneumatic Rock Drills (UG)	110-120+
Pneumatic Rock Drills (Surface).....	97-110
Pneumatic Mucking Machines.....	100-116
Pneumatic Slushers	91-106
Fans	90-110
Compressors	95-106
Shovels (Diesel)	91-107
Shovels (Electric)	83- 91
Dozers	102-106
Front End Loaders.....	95- 97
Crushers	91-101
Screens	98-109
Washers	92-104
Trucks (+ 15 Ton)	89-101

Table I

by the equipment manufacturers, and there is mounting evidence of positive results in designing-out noise, although a great deal remains to be done. Almost all manufacturers of air compressors, for example, have a line of "quiet" equipment; compressors that once would measure 105 dBA or higher are now available at 85 to 90 dBA; and rock drills with built-in, not removable, noise mufflers are available. I have not yet measured noise levels at these machines, but I have talked to miners who have used them—and when a hard rock miner who has lost most of his hearing tells me he can tell a big difference in the sound, the improvement must be real.

At least one company manufactures a pavement breaker with muffler and a strap-on jacket to reduce noise output. Another company is installing a soundproof cab on a multi-drill jumbo. Furthermore, considerable work has been done on fan blade design, so quiet fans are becoming available. And even the dream of the air-conditioned cab for heavy equipment is near reality and probably will be available shortly for marketing.

With the exception of some of the compressors and rock drills, all of these items are special order at this time. How long they remain in this category will depend on competition from other manufacturers and customer demand, with a possible added incentive brought about by the potential threat of product liability suits. Equipment users should make their needs known to manufacturers and should insist on "quiet" equipment for replacements. In most cases, the added cost is a small fraction of the total cost and a small price to pay for reducing the hazard of noise-induced hearing loss and the concurrent risk of hearing-loss claims. Improved operator efficiency alone would probably offset such costs.

There are also means to reduce noise levels of equipment now on hand. Pit and quarry equipment such as dozers, loaders, shovels, trucks, scrapers and graders should have effective mufflers—located as far as practical from the operator compartment. Another successful method uses sound-absorbent materials in engine and operator compartments. As for noisy compressors and fans, they can be enclosed and the duct work lined with sound-absorbent material.

If administrative and engineering controls do not reduce exposure to required limits or are not feasible, then an effective hearing conservation program must be set up and followed. In order to be effective, the program must include an educational program to insure that all employees concerned thoroughly understand the hazard that exists. Employees must also be trained in the use, care, and limitations of protective devices provided by the company. Audiometric testing must be provided, preferably pre-employment and periodic thereafter, as prescribed by a physician or medical consultant.

In conclusion, I would like to summarize the noise control efforts of California industry.

- (1) Some companies are doing an excellent job. They have defined their problem, they have provided engineering control where feasible, and have put hearing conservation programs in effect where required. Further, they are making continuous studies of their operations, looking for appropriate ways to administrative controls and additional engineering controls.
- (2) Some companies initiate hearing conservation programs which die on the vine after a few months, for various reasons.

MEAN HEARING LEVELS BY AGE GROUPS
FOR HEAVY EQUIPMENT OPERATORS

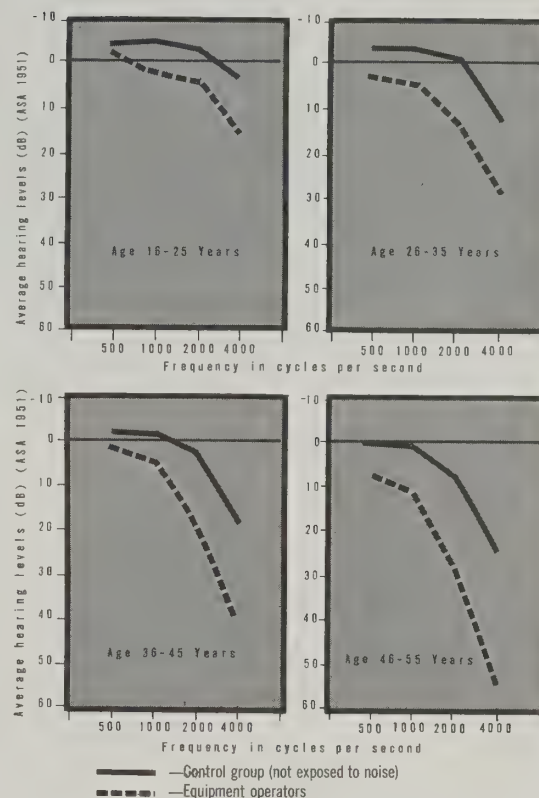


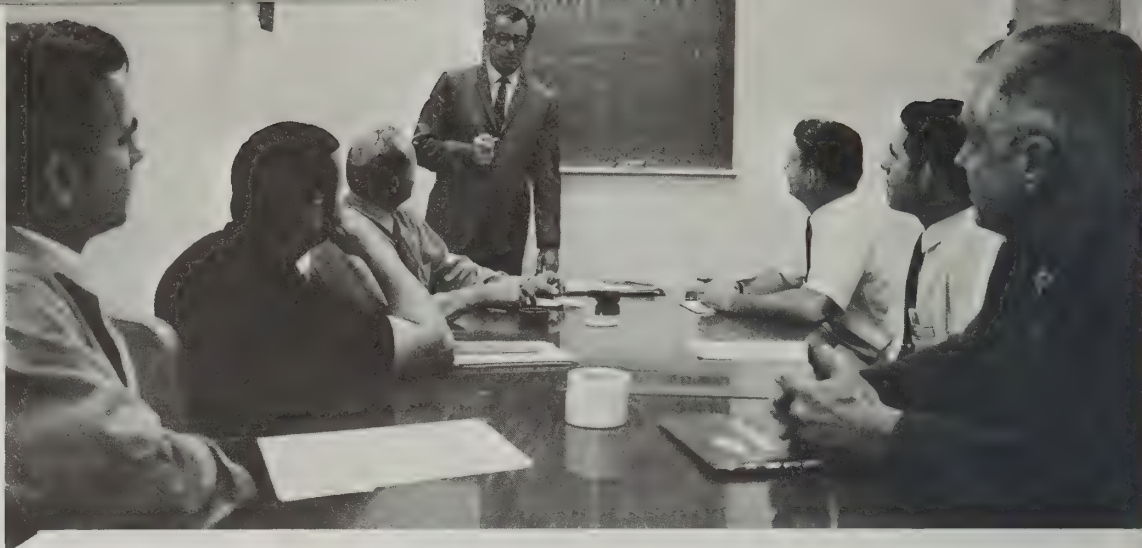
Figure 1

- (3) Some companies buy a few sets of ear plugs and tell the men that they are available, and that's it.
- (4) Labor, in those companies with effective programs, deserves a large share of the credit for the success of the program.
- (5) Some labor unions are making commendable effort through pressure on equipment manufacturers to design and manufacture "quiet" equipment.
- (6) Some companies and labor groups do nothing at all because they are not aware of the problem.

To those with effective programs, I offer congratulations for a job well done. Keep up the good work! I would urge others to review their situation in the light of what we now know about noise hazards to workers. The Division of Industrial Safety stands ready to assist in setting up a program. We are as close as your nearest telephone.

Ken Nobs adapted his article from a speech that he delivered at the 1970 Governor's Industrial Safety Conference in San Francisco.

Industrial Indemnity Company's San Francisco safety engineering manager Norval MacDonald reviews the plant program with Pacific Pumping Company supervisors.



Industrial Indemnity's Training Program

Line supervisors become safety inspectors

**Jack W. Pedersen, Vice President
Industrial Indemnity Company**

"The insurance company's safety inspector is coming tomorrow."

In some industrial plants this would be the signal for a flurry of activity by department heads checking to see if the new safety posters were up, a quick check by supervisors to see if the right safety gear was on hand, and a warning to the men to be sure and use it when the inspector came around. The plant would then be "ready" from a safety point of view.

This old and all-too-familiar picture has been changed in over 20 California plants served by Industrial Indemnity Company; we attribute this change to our program of supervisory safety training. This program has the effect of turning each line supervisor into his own safety inspector, and one, moreover, who is on the job every day, not just during a once-a-month inspection tour when things have been prettied up.

Normal Safety Orientations Found Inadequate

In the case of many safety orientations, senior supervisors from a broad spectrum of industries are gathered together for a day to be lectured by a representative from the insurance carrier. There are several drawbacks to this; for instance, there is a considerable loss of working hours by key personnel, and the wide diversity of jobs performed by the attending supervisors compels the safety engineer to be general in his lecture. So general, indeed, that these sessions often degenerate into an exchange of platitudes on the order of "Alertness Is the Key to Safety," rather than a useful exchange of ideas. Mottoes are soon relegated to the realm of "ho-hum" unless they apply directly (and, if possible, dramatically) to the person at whom they are directed.

Mandatory Training Sessions Used to Advantage

Industrial Indemnity's safety engineers had long been aware of these drawbacks and our new program of

Supervisory Safety Training was developed to overcome them. Firms which qualify for schedule rating credits (i.e., lower insurance premiums for safety activities) are required to hold a monthly safety meeting of supervisory personnel in order to maintain that status. In the firms subscribing to Industrial Indemnity's new Supervisory Training Program, this mandatory meeting has been expanded into a useful safety course under the supervision and control of our safety engineer.

This system offers several advantages to the firm so serviced. For one thing, key supervisors are not taken away from the job to attend lectures somewhere across town. Furthermore, they are in a position to return to the job immediately after the training session. The points that were raised are still fresh in their minds and can be applied in practice. The plant itself serves as a "safety laboratory" in which supervisors can observe the effect of safety procedures which relate directly to their own departments. These mandatory monthly safety sessions, which are, in some plants, attended more dutifully than enthusiastically, have thus been converted into platforms for a lively exchange of ideas monitored by the Industrial Indemnity safety engineer.

Industrial Indemnity's Norval MacDonald, Safety Engineering Manager at San Francisco—working with Robert T. Chamberlin, Home Office Manager for Safety Services, and other safety engineers at Industrial—developed the comprehensive program, which runs for an entire year.

"After those 12 sessions," says MacDonald, "I just monitor their meetings and answer questions. It's not like the old way of coming in as an inspector." He reports a marked reduction in accident frequency in every case where this technique has been applied.

12-Point Program Developed

The training sessions make liberal use of visual aids developed by the safety engineering staff at Industrial Indemnity, and training films supplied by the National Safety Council. During the first session, supervisors are asked to list reasons why good safety practices are of

A Toesaver: Industrial Indemnity's safety engineering manager demonstrates how to block up a pump-housing. Even safety shoes might have a hard time handling one of these, if it rolled off the table!

direct benefit to them. The reasons they come up with are written on a transparency and projected for everyone to see. The various points are then discussed, with the safety engineer providing suggestions. At this meeting, and at subsequent sessions, the emphasis is on making the supervisors volunteer ideas on their own, rather than passively absorbing ready-made slogans.

By the end of the second session they are ready to go into the plant and write a series of Job Safety Analyses on jobs falling within their respective departments. A Job Safety Analysis breaks down each job into a series of steps, describes the safety hazards inherent in each, and suggests preventive measures that should be taken to guard against them. Supervisors thus become their own inspectors and learn to look for unsafe situations. These Job Safety Analyses are then read aloud at the next session and discussed.

The fourth session is devoted to the importance of accident investigation and to stressing that fact-finding is more important than fault-finding. Supervisors are encouraged to develop accident investigation forms that apply directly to the type of operation carried out in their departments. Accidents which occur in the plant during the year covered by this training course are investigated using these methods and discussed during the next meeting.

Environmental Hazards, Housekeeping Stressed

During the fifth session, supervisors are asked to enumerate the various environmental hazards, such as fumes from spray painting, flying metal chips, moving machinery, and other dangers which are inherent in their department. They give their own ideas on reducing these, after which training films are shown, illustrating how these problems have been met in similar situations.

The importance of good housekeeping is stressed in the sixth session, using transparencies taken in the plant. Supervisors usually tend to blame the employees for being "sloppy." By the end of this session it is made clear that part of what a supervisor is paid to do is see that employees are not allowed to be sloppy.

In the seventh session supervisors develop their ideas on the proper indoctrination of new employees and the best way to select the right man for the job. The eighth through eleventh sessions are concerned with various types of "problem" employees and how to deal with them. Supervisors cite examples within their own departments and describe what they have done about the situation. Training films on such subjects as "The Forgetter" and "The Hothead" are shown and discussed.

Pacific Pumping Company supervisors watch MacDonald demonstrate the value of a retracting shield. Machine operators can see exactly what they are doing without being exposed to flying fragments. The shield slides to one side, permitting access to work when operation is complete.



Increased Cooperation Results

By the end of the twelfth session, which is spent summarizing the material covered during the year, the safety program is self-regenerating. Supervisors have become accustomed to getting together and airing their problems in open forum, and to looking for potentially dangerous situations on their own. Industrial Indemnity's safety engineer continues to attend monthly meetings as an observer and to answer questions. Supervisors who have completed the 12-month course are awarded a certificate.

The biggest single effect of this program has been to put the supervisor on the same side of the safety engineer. This increased cooperation between plant personnel and Industrial Indemnity service representatives has appreciably lowered the accident rate and effected significant premium savings for the participating companies.

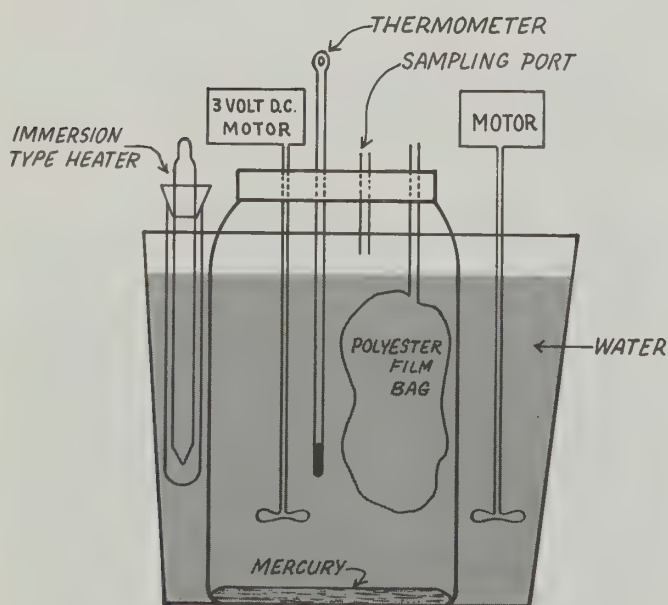
This is the first article in a series devoted to special programs for training in industrial safety. In the next issue of California Safety News, John Inman, Safety Services Officer of the State Compensation Insurance Fund, will describe his agency's safety training programs.



Static calibration of mercury vapor detectors

Walter Van Sandt, Industrial Hygiene Engineer
State Division of Industrial Safety

Assembled mercury calibration unit showing withdrawal of mercury-saturated air with a syringe.



SCHEMATIC DRAWING OF ASSEMBLED CALIBRATION DEVICE

Figure 1

During the past few years, mercury mining in California has steadily increased to meet the expanding demands for a diverse number of industrial uses. Mercury is an important component in the electrolysis of sodium chloride, for example, and is also widely used in scientific instruments like barometers, thermometers, hydrometers, and polarographic cells. The long list of diversified industrial uses of mercury is impressive: in electrical switches, fluorescent lamps, ultraviolet lamps, and electronic rectifiers; in the manufacture of mirrors; and as a catalyst in the chemical industry. Furthermore, mercury now finds greater and greater use in pharmaceuticals, agricultural chemicals, and antifouling paints.

To carry out industrial hygiene surveys of the expanding mercury mining and smelting, the State Division of Industrial Safety purchased three mercury vapor detectors. These instruments must be calibrated periodically, but industrial hygienists over the years have experienced considerable difficulty in preparing known concentrations of mercury vapor. Difficulties with various designs of dynamic mercury vapor calibration devices have been intensively investigated by Nelson.¹ Because of the high density and high boiling point of mercury, such devices are somewhat complicated. A reliable source of compressed air is essential. The concentration of mercury vapor in air under equilibrium conditions at given temperatures has been studied for years.² It was on the basis of this physical principle that we designed our apparatus.

APPARATUS—One gallon capacity wide-mouth glass fruit jar with lid; one galvanized water bucket of six-quart capacity; one immersion type water heater—the type sold in pet stores for home aquariums is satisfactory; one thermometer with 1/5 degree divisions; heat sealable polyester film—Type 25A6 (3M) is satisfactory; a small motor with propeller is shown in the illustration. Later experimental work showed that a stirring mechanism was not essential for the satisfactory operation of this apparatus; chemical drying agent such as dryrite or anhydrone; Saran bags, 16.5 liter size (Vilutis Company, 50 Center Road, Frankport, Illinois 60423).

TESTING AND EVALUATION—The apparatus was assembled as shown in Figure 1. The mercury pool in the jar is just sufficient to cover the bottom. The polyester bag inside the jar acts as an air reservoir. When samples of air saturated with mercury vapor are withdrawn, room air enters the bag. Thus, the concentration of mercury vapor in the air sample withdrawn remains constant. There is no dilution error. Samples can be withdrawn until the inside bag is fully inflated. An aspirator bulb can be used to evacuate the bag when preparing for a second series of tests. The water bath heater was adjusted to maintain a constant temperature slightly above room temperature. A period of at least 24 hours was allowed for equilibrium conditions to be-

come established inside the jar. A measured amount of air saturated with mercury vapor was withdrawn from the jar with a 100 ml. syringe. The air sample was bubbled into a solution of 1 percent potassium permanganate in one normal sulfuric acid. This solution absorbs mercury vapor with 99 percent efficiency.³ The amount of mercury was determined by the dithizone extraction method of analysis.⁴ The analysis was performed in triplicate from slightly-above room temperature to 82° F. The weight of mercury vapor per cubic meter of air was calculated. The data was plotted as milligrams mercury vapor per cubic meter versus temperature. (See Figure 2.)

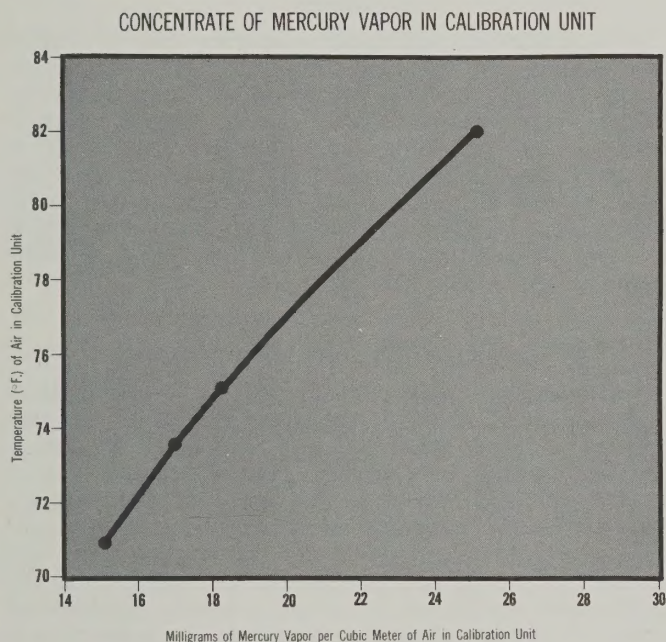


Figure 2

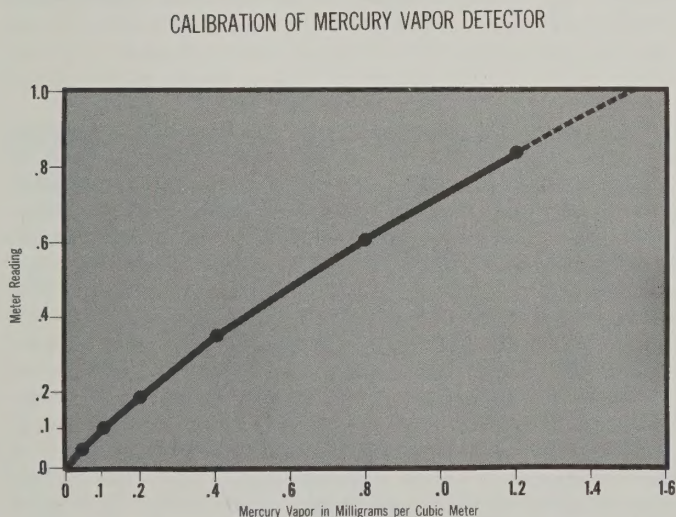
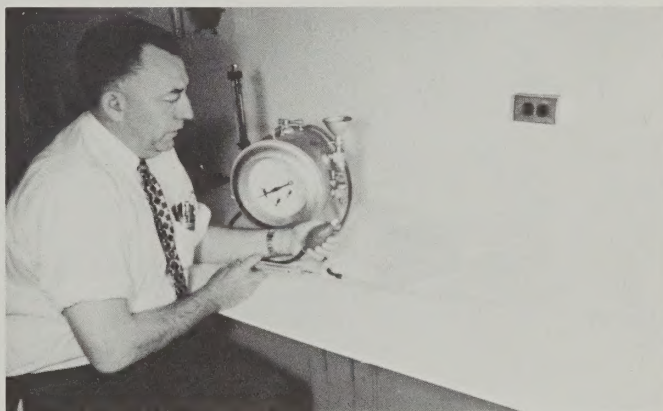


Figure 3

CALIBRATION PROCEDURES — A measured amount of air saturated with mercury is withdrawn from the calibration unit by means of a syringe. The temperature is recorded. This saturated air is slowly injected into a Saran bag simultaneously with the filling of the bag with room air. A wet test meter or rotometer can be used for the latter operation. (See accompanying photos.) If the wet test meter is used, a drying tube should be placed between the meter and the bag. The mercury vapor detector which has been warmed up and balanced is now attached to the bag. With the Lemaire Hg Detector, the metallic sampling probe must be removed as it is not airtight. A Tygon tubing is connected directly from the instrument air pump to the bag. The pointer will rise to a certain value and remain stationary. This reading is recorded. The above test is repeated using from four to six different concentrations of mercury vapor in air. The Saran bag can be completely freed of residual mercury vapor by inflating and exhausting three times with room air. A plot of true or actual mercury vapor per cubic meter of air versus meter readings is drawn. (See Figure 3, accompanying photo, and Table 1.)



Adding measured amounts of mercury-saturated air and room air simultaneously to polyester bag.



Determining a calibration point on the mercury survey meter.

Temp. °F.	Vol. Hg Sat. Air (ml)	Vol. in Bag (l)	Hg in mg/m ³ from curve	Hg in Bag Calc mg/m ³	Meter Reading
76.7	10	4.63	19.6	0.042	0.05
76.3	25	4.63	19.2	0.102	0.10
76.3	50	4.63	19.2	0.205	0.175
76.0	100	4.63	19.0	0.40	0.35
76.3	200	4.63	19.2	0.80	0.6
76.7	300	4.63	19.6	1.20	0.83

TABLE I

CALCULATIONS—A convenient volume of room air to add to the Saran bag is from 4 to 5 liters. This allows some 300 to 400 milliliters of mercury vapor saturated air to be withdrawn from the calibration unit. Greater volume may burst the bag within the jar. This volume easily allows for 4 to 6 calibration points to be obtained. From the temperature inside the calibration unit, determine the concentration of mercury vapor per cubic meter. (See Figure 2.) The following formula may be used to calculate the final concentration of mercury vapor inside the Saran bag.

$$\frac{A \times B}{C + B} = D$$

where A is milligrams of mercury per cubic meter in saturated air.

B is the volume in cubic meters of mercury vapor saturated air withdrawn from the unit.

C is the volume of room air in cubic meters pumped into the Saran bag.

D is milligrams of mercury vapor per cubic meter of air in the Saran bag.

ACKNOWLEDGMENTS—The author wishes to express his appreciation to the following persons for their assistance: Mike Ota and Bud King of the Santa Clara County Health Department, who carried out the mercury dithizonate analysis; and Gary Nelson of the Lawrence Radiation Laboratory, who compared static and dynamic methods of calibration.

¹Nelson, Gary, O., A Dynamic Method for Mercury Vapor Detector Calibration, University of California, Lawrence Radiation Laboratory, Livermore. UCRL-7730, and 71481.

²Syllabus for Short Courses for Industrial Hygiene Engineers and Chemists, Public Health Service, Publication No. 614, Page D-9, Government Printing Office, Washington, D.C. (1958).

³Nelson, already cited.

⁴Sandell, E. B., Colorimetric Metal Analysis, Vol. 3, pp. 629-35, Interscience Publishers, Inc., New York (1957).

First Aid Care

. . . fourth in a series

Physical shock

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Shock

A state of shock will occur whenever there is collapse in the circulation of blood throughout the body. Shock can be brought on by many unrelated types of injuries, diseases, reactions to medicinal drugs, poisons, excessive heat or cold, emotions, and unpleasant sights such as seeing blood. Shock may develop rapidly, or the onset of shock may be delayed by some hours. It may be so slight as not to be recognized or may be so severe that it results in death of the individual from injuries which normally should not have been fatal.

Signs and Symptoms of Shock

When shock is present, the face of the white individual will be pale or white; in the negro individual, the face will appear ashen gray and dull in luster. The skin is cold and clammy; cold beads of perspiration may be seen in the face and forehead; the pupils of the eyes are usually dilated, and eyelids may droop. Depending on the state of shock, the individual may appear tense and anxious. If he is lapsing towards unconsciousness, he will appear dull and listless. Breathing is usually shallow and rapid; it may be regular or irregular. The pulse is soft, rapid, weak, and veins are collapsed. There may be nausea and vomiting, especially if there are hemorrhages in the stomach or intestines.

Nervous System in Shock

The autonomic nervous system is a part of the nervous system which is distributed to smooth muscle such as occurs in blood vessels and various organs and glands throughout the body. This system consists of two separate but interconnected and coordinated systems; namely, the parasympathetic (head-low back) division and the sympathetic (chest and abdomen) division. The brain is part of the central nervous system and is a collection of nerve centers, each functioning as a central station for some part of the body with trunk nerves connecting the part of the body with its specific center. These trunk nerves leave the brain bundled into the spinal cord which passes through the opening in the center of the backbone or spinal column; from there the nerves branch off to all parts and organs of the body. The nerve fibers entering and leaving the spinal cord are mainly of two types: (1) sensory nerve fibers which enter the spinal cord, conveying sensations such as heat, cold, light,

touch, and pain from different parts of the body to the brain center, and (2) motor nerve fibers which leave the spinal cord to convey impulses from the brain to the muscles of movement.

The sympathetic system is a series of nerve centers in the chest and abdominal cavity along the spinal column. Each of these nerve centers, although interconnected with the parasympathetic, presides over and controls vital organs and vital functions. This system is not under control of our will, but through it involuntary muscles are stimulated to act identically when we are awake and when we are asleep. Thus, our hearts beat, we breathe, our blood pressure is maintained, we digest our food, and our excretory organs function without any effort on our part.

The parasympathetic system distribution, in contrast to the sympathetic system, is entirely confined to the organs.

There is functional antagonism between these two systems as indicated in the chart illustrated below.

Function	Sympathetics	Parasympathetics
arteries	constricts	dilates
heart rate	accelerates	slows
pupil	dilates	constricts
sweat glands	stimulates	little or no effect
gland secretion in intestines	inhibits	stimulates

The nervous system under stressful conditions will also stimulate the endocrine glands directly or indirectly to liberate powerful chemicals called hormones into the blood. At the base of the brain is located a master endocrine gland called the pituitary gland. The pituitary liberates many hormones, many of which have a direct influence on other endocrine glands of the body. The adrenal glands on top of the kidneys are stimulated to release many hormones. All these chemicals play a vital role in combating the state of shock. In addition, when the blood vessels entering the kidneys are constricted by the sympathetic nervous system and the norepinephrine hormone from the adrenal, the kidney liberates a chemical called rennin which will also raise the blood pressure. In this brief and incomplete description of the role of the endocrine system combating shock, it can be readily seen that these hormones complement the nervous system in combating shock.

Different Mechanisms by Which Shock Is Produced

Hypovolemic shock occurs whenever there is insufficient volume of blood in the circulatory system to sustain normal physiological functions of the body. This condition occurs whenever excessive hemorrhages occur, and also when blood vessel walls are damaged by severe infections, poisons, or adverse reactions to medicinal drugs which cause the serum to ooze through the blood vessel walls into the tissues. Other causes include extensive burns, which cause loss of fluid through oozing and loss of body fluids, and loss of fluid by vomiting and diarrhea.

Vasomotor shock occurs whenever the blood vessels become and remain excessively dilated for prolonged periods as a result of the malfunctioning of the nervous system. In this situation there is no loss of blood volume, but an insufficient amount of blood is returned to the heart because the blood is pooled in the blood vessels.

When the brain receives an insufficient amount of oxygen from the blood, fainting will occur and can lead to the collapse of the individual. This is usually associated with malfunction of the nervous system.

Cardiogenic shock occurs when the heart is unable to function properly and cannot supply sufficient blood to the vital tissues and organs. The most common cause for cardiogenic shock is plugging of the blood vessels which nourish the heart muscle (heart attack).

Treatment

Shock is a dangerous condition that should be given prompt attention, and medical aid should be obtained as soon as possible. The victim should be placed in a comfortable position, lying down. The head should be level with the body, except in cases of unchecked severe hemorrhage from the head, sunstroke, fractured skull, and apoplexy, when the head should be raised. If there is a moderate slope of ground where the victim is lying, the head should be placed downgrade. Where the victim is supported by a stretcher or body splint, the foot end of the device should be elevated about six inches.

Foreign objects should be removed from the mouth, and the tongue should be brought forward so that it is not blocking the windpipe. The patient should be wrapped in blankets or other covering, making certain to place something under as well as over the body to prevent loss of body heat to the ground or floor. Any clothing that restricts breathing should be loosened, and the victim should have plenty of fresh air; first-aiders should insist that the curious stand well back. If conditions such as cold weather make use of external heat desirable, heated objects such as hot water bottles, bricks, or stones should be applied along the body, between the legs, and in the armpits. The heated objects should be wrapped and tested before application so they will not burn the patient.

If the patient is conscious and able to swallow, he may be given sips of warm water, but not to exceed a cupful each half hour. Aromatic spirits of ammonia on a piece of cotton, gauze, or cloth may be placed under the patient's nose for brief periods at frequent intervals. The dampened material of aromatic spirits of ammonia should be tested by the first-aiders on himself to determine its effectiveness. Inhalation of oxygen often is helpful in treating physical shock. Physical shock treatment should be continued as long as the condition exists or until the patient is placed under the care of a physician. Actually, if first-aiders do nothing more than have the patient lie down with his head low and keep him warm, they have assisted the victim and the doctor a great deal.

Fainting

Fainting is temporary loss of consciousness caused by an inadequate supply of blood to the brain, and is a mild form of physical shock. Fainting may be caused by an injury, the sight of blood, exhaustion, weakness, heat, lack of air, and emotional disturbances. The victim feels weak and becomes dizzy, black spots appear before his eyes, his face becomes pale, and his forehead is covered with perspiration. He usually slumps back into his seat or falls to the ground unconscious. The symptoms usually occur in a few seconds.

Fainting is one of the more frequent occurrences that requires first aid. A person lying down seldom faints, so

in first aid it is always best to have the patient in a prone or supine position. Injuries should be dressed while a victim is lying down, as he may faint suddenly if standing or sitting. He may then fall, either aggravating existing injuries or causing additional ones. Lowering the victim's head immediately may prevent his lapsing into unconsciousness when early symptoms of fainting are noted. If a person is sitting, bend the body at the waist and bring the head between the knees. Blood will then flow to the brain and assist the victim in gaining control of his faculties.

Treatment for fainting is essentially the same as that for physical shock. The head should be lowered, the mouth cleansed, tight clothing loosened, circulation of fresh air maintained, the patient kept warm, and aromatic spirits of ammonia administered by inhalation. If unconsciousness is prolonged, a physician should be summoned.

To Be Continued

Next Issue: Wounds and Burns, Fifth of a Series

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